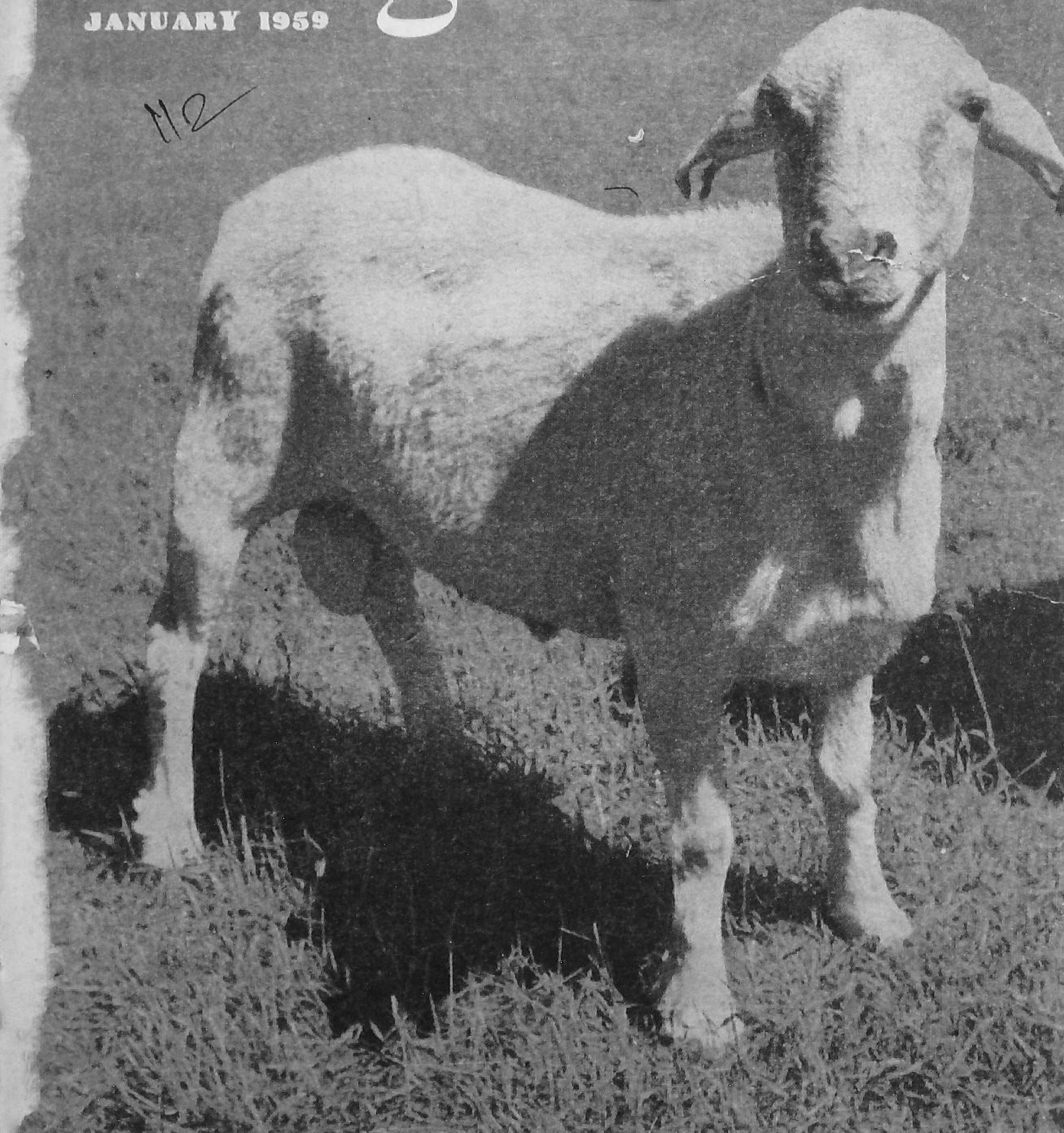
Indian

Farming

JANUARY 1959

OFFICE OF THE PRINCIPAL
22 JAN 1959
RURAL EXTENSION



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Vol. VIII No. 10

OUR COVER

Looking straight into your eyes here is a typical Bannur ram. This small-sized Mandya sheep of Mysore stands out as an excellent meat-yielding type. No clip, but useful in a mixed farming plan

Photo by H.K. Gorkha

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Indian Farming

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Editor : **Harkirat Singh**

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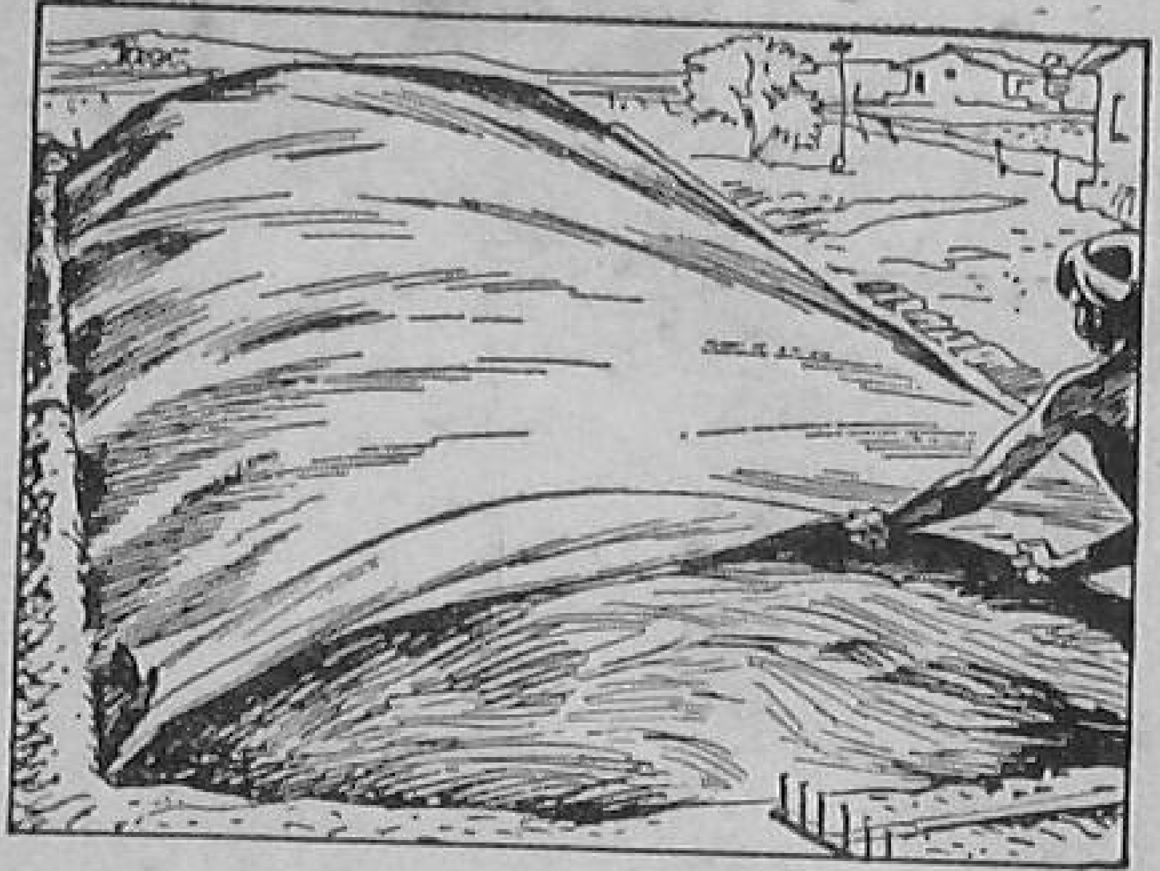

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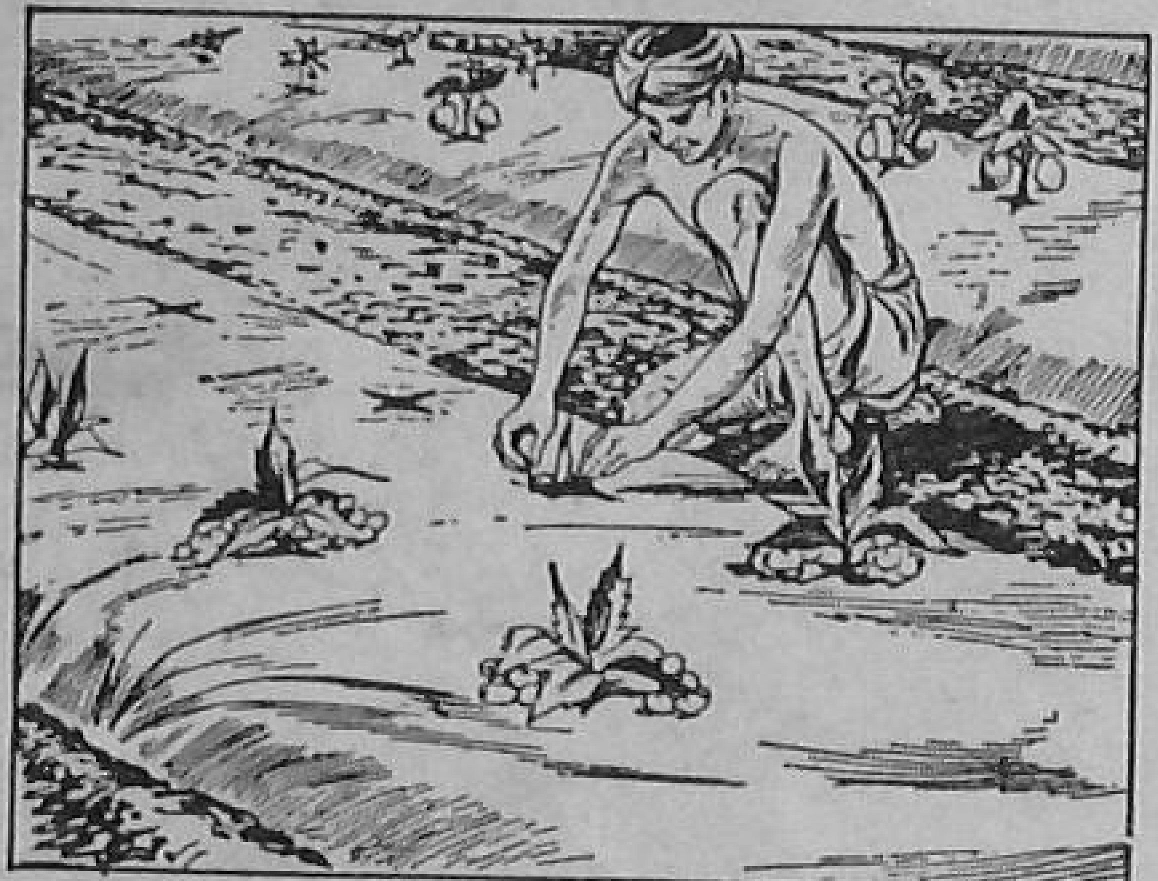

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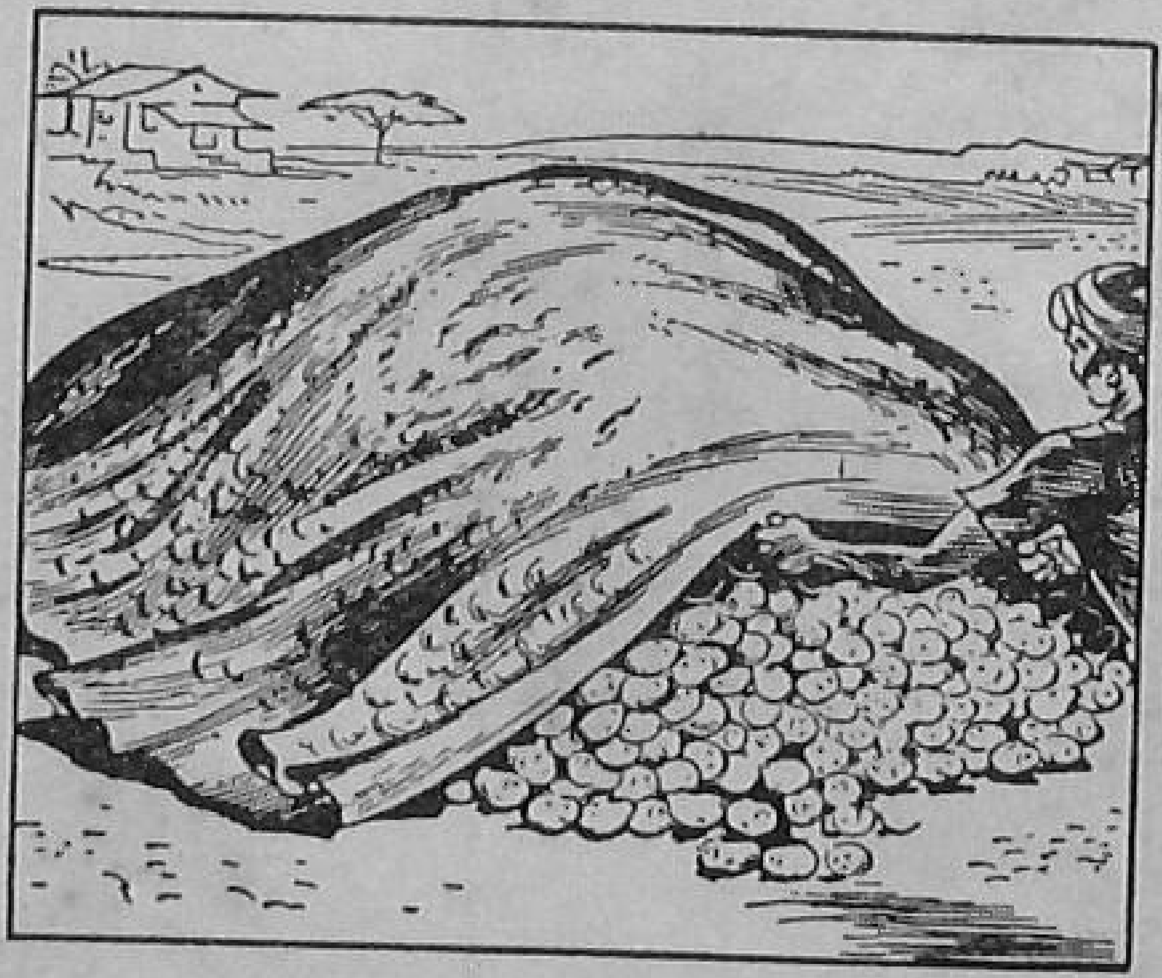

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THE RAT PROBLEM

THE many ways in which the rat deprives the nation of huge quantities of food makes it our worst enemy; the speed with which it multiplies makes its control real difficult.

The rat begins its despoiling task right when the seed is sown in the field. It eats away the germinating seed, does not spare the growing crop, picks out ripening grain from the ears and is ever-present in the godown where the grain is stored. The pity of it is that it wastes more than what it eats, and also carries and spreads diseases.

A single pair of rats unchecked can become a family of 250 within a year. The present rat population of the country is estimated at 2,400 million. The quantity of food consumed or wasted by rats, therefore, runs into a sizable figure. Many more mouths could be fed even with our present food resources only if farmers *acted* against this Nuisance No. 1.

The need of the day, therefore, is rat control measures in the farm home, in the field and in the store. In fact, rat control forms an important part of the current *rabi* campaign for increased production from food crops. Rats are being killed by catching them in traps, by fumigating their burrows and by the use of poison-baits.

But what would make these measures really effective is a genuine desire on the part of every farmer to exterminate the menace. The objective can be achieved only by a concerted action and not isolated efforts. The rat must be declared a national enemy, and a war on it proclaimed.

It would be interesting to know that a mass-scale action against rats in 1954 gave farmers of six districts of the former Hyderabad State an additional 300 tons of foodgrains. In all about 11,000 acres were covered. In terms of money, the saving amounted to Rs. 90,000 !

YOUR QUESTIONS

and

SUGGESTIONS

are

WELCOME

Address these to
The Editor, "Indian Farming," I.C.A.R.,
Queen Victoria Road,
New Delhi-2.

Truck Farmer Thinks a Lot of Vegetables

A cauliflower to be proud of

by
Harkirat Singh

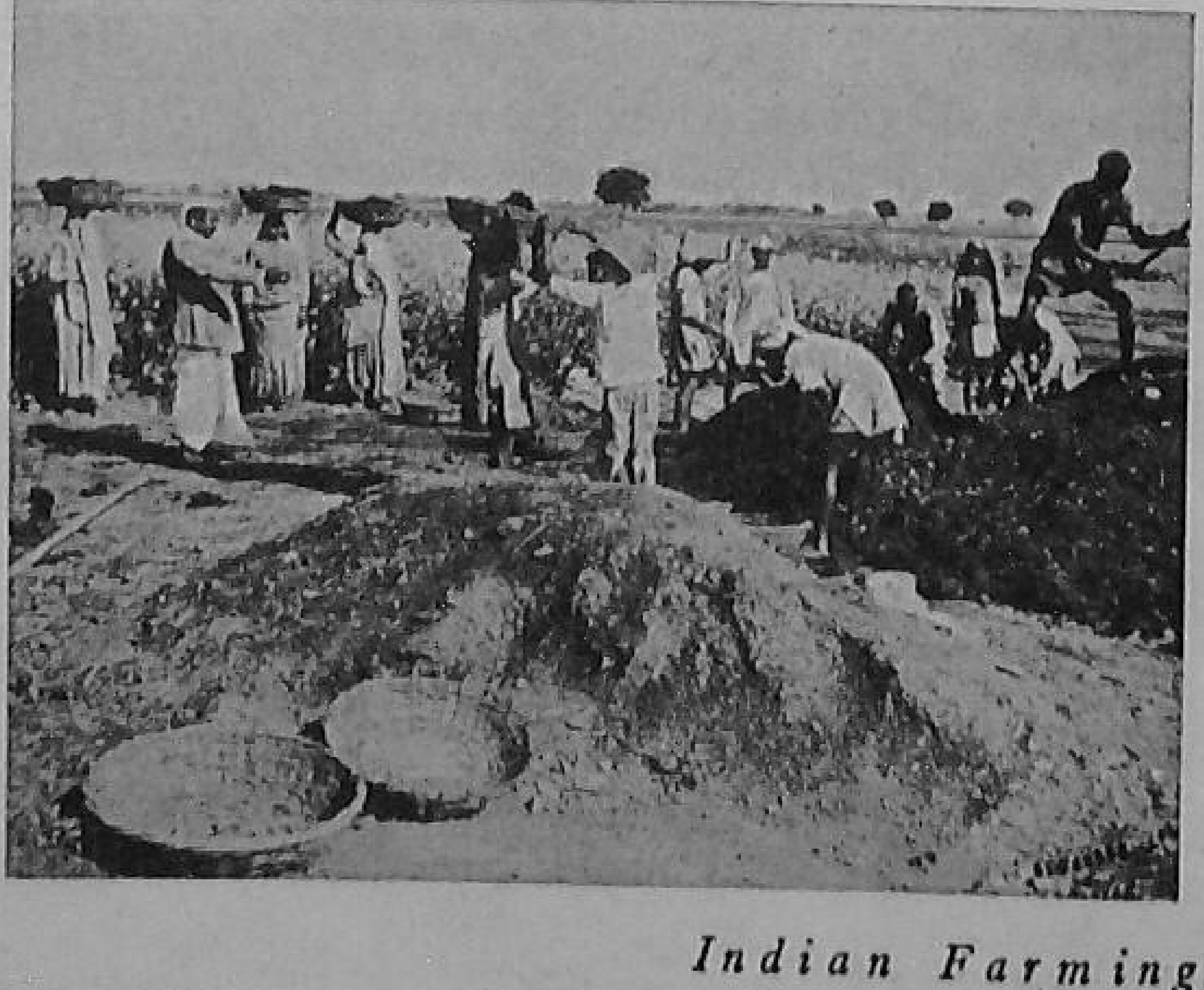
IN the immediate neighbourhood of the municipal dump in Ghaziabad in Uttar Pradesh is a vegetable farm which is quite prosperous. It is the work of two generations. The father, Shri Budha Singh Saini—after whom it is named—gave it a shape out of an uneven thick jungle waste; the son, Shri Din Dayal, today manages it and has brought to it all the improved methods.

"Many people do not take to vegetable cultivation because of the hard labour required for it," Din Dayal started off a conversation with me, when I visited his farm last month. "But my father saw good income in it and so took this land on lease from the Government some fifty years ago. Since then, our family has specialized in growing vegetables," he said.

NICE FIELDS

Nicely laid out, spick and span vegetable fields are pleasing to the eye: the Saini Farm has seventy acres of them. Vigorous crops of radishes, turnips, cauliflowers, cabbages, tomatoes and brinjals were very much in evidence, and young crops of peas and potatoes were coming up quite nicely. Din Dayal plucked a few

Manure by the truckload



ripe, red tomatoes for me and I found they were luscious to taste, too.

SUCCESS FORMULA

A wise blending of the old and the new—the skill acquired by the family over a long period and the scientific recommendations made by the agriculture department—is the "success formula" of Din Dayal. Whatever he does, he put it briefly for me like this:

A thorough ploughing of the land; at least four times with tractor and four times with the *desi* plough.

Adequate manuring, a minimum of 15 truckloads of farmyard manure per acre, besides the recommended doses of ammonium sulphate, superphosphate, if available, and also groundnut and castor cakes. "I am the largest single buyer of municipal compost in Ghaziabad, and sometimes I buy it from as far as Delhi also," he added.

Nothing but improved seed. He grows: *Snowball* and *Purple Top* turnips; *Bonny Best* and *Marglobe* tomatoes; *Early Patna, Snowball, China Pearl* and *Katki* cauliflowers; *Drumhead* cabbage; *Marrow Fat* and *Simla Cap* peas. "I purchase all my seeds at the Government Seeds Store. For three years thereafter I save my own seed, and then again put in fresh seed," he informed me.

Frequent shallow cultivations to destroy weeds and provide a soil mulch. Timely irrigation—he has three tubewells. Protection of crops from pests and diseases.

SMALL STUDY

He led me to his study: yes, he has a small study where he keeps whatever information material on vegetable-growing he is able to gather, some agricultural magazines, seeds catalogues and plant protection literature from commercial firms; also, a number of photographs taken on his farm showing outstanding crops and recording visits of important visitors. "The commercial insecticides I use only after consulting the plant protection officers of my area," he told me.

The business man in Din Dayal came out when he revealed that he personally was not in favour of very big fruits. "I prefer varieties which give me neither too big nor too small a size," he began explaining, "and there is a reason for this: the requirement of the ordinary customer who wants to buy in small quantities. Of course, the quality *has* to be good," he added.

Who would not believe that the produce of the Saini Farm is in demand even in the Delhi market, that it sells at a premium and that Din Dayal is finding vegetable farming much more paying than any other type of farming ?

Seen here in full bloom is a radish seed crop

An apt reward for hard labour—ample fine produce

Typical spots on a *jowar* leaf. Note the small, black dots in the centre

Red Spots That Rob You of Jowar Fodder

by
Kishan Singh Bedi
Plant Pathologist, Punjab
and
Jaswant Singh Chohan
Assistant Plant Pathologist
Government Agricultural College
Ludhiana

COMPARATIVELY less harsh on the grain yield, the leaf-spot disease causes a serious reduction in the yield of fodder from the *jowar* crop.

Sorghum or *jowar* (*Sorghum vulgare* Pers.) is the premier *kharif* fodder crop of the Punjab and a prominent grain crop of the south-eastern rain-fed tracts of the State. The disease is locally known as *jowar ke patton par lal dagon ki bimari*. The red spots on the leaves are caused by at least six different fungi and one bacterium. Amongst these, the red leaf-spot disease due to the fungus *Colletotrichum graminicolum* (Ces.) Wils. and known as Anthracnose is extremely serious, particularly in humid places of the State, like Gurdaspur, Hoshiarpur, Ambala and Karnal districts.

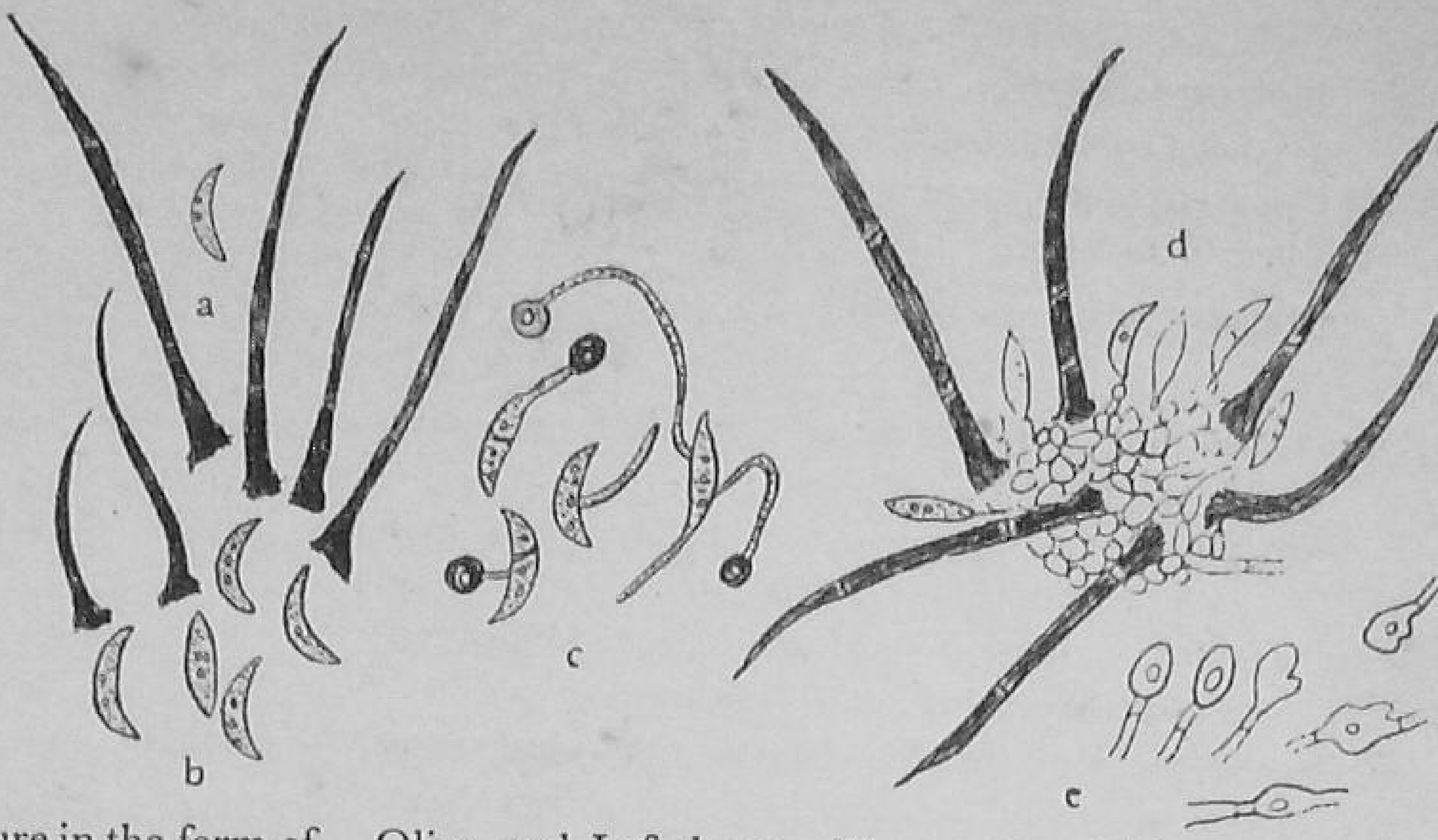
The disease first appears on the leaves in the form of very small, circular or oval spots which enlarge during the monsoon season under favourable weather conditions, i.e., a suitable temperature, high humidity and abundant rainfall. They often coalesce and kill most of the leaf-area. The leaves affected in this way become dry, are soon cast and the stalks denuded. The red spots also appear on the midrib of the leaves and on the leaf-sheaths, where they are more long than broad.

In the centre of the majority of the spots and over the dead straw-coloured areas of the leaf, very small black dots appear in groups. These are the fruiting bodies of the fungus. They contain in them spores or microscopic reproductive structures of the fungus, along with long and black bristle-like structures.

The spores contained in these fruiting bodies are spread widely during the rainy weather accompanied by wind. After settling on the leaves, these spores

Stalks and diseased leaves of *baru*

The causal fungus : *a.* **and** *b.* **bristle-like black structures along with boat and sickle-shaped spores,** *c.* **germinating spores with germ-tubes,** *d.* **a fruiting body, and** *e.* **the thick-walled spores**



g rminate under the influence of moisture in the form of free water and suitable temperature (25° to 35°C) by producing one or more germ-tubes with knob-like bodies, with which they attach themselves to the leaf-surface before penetrating and causing infection. Thick-walled resting spores (chlamydospores) are also produced by the fungus in great abundance. If the weather conditions are favourable for the development and spread of the disease, field after field is engulfed by it and suffers great damage.

The ears also get infected as soon as they emerge from the upper leaf-whorl of the *jowar* plant. The glumes and the seed-stalks also contract infection in the form of very small, circular to elongate, deep-red spots, with small, black, fruiting bodies of the fungus in them. If the infection is severe, not only is the seed-setting in the ears reduced, but also the grains that are formed are not filled properly and shrivel, resulting in poor-quality produce.

The red spots, and even the black fruiting bodies, appear on the grains under severe infection, particularly when the rainy season becomes prolonged till the end of September.

Countless spots covering the new winter growth of a stubble plant of *jowar*

OTHER LEAF-SPOTS

Given below are the characteristic points which distinguish the other leaf-spots of *jowar* from Anthracnose.

Grey leaf-spot caused by *Cercospora sorghi* Ell. and Ev. The spots produced by the disease are rectangular and blood-red in colour, with grey centres. They extend in between the leaf-veins and attain a length of one to three centimetres.

Ramulispora leaf-spot caused by *Ramulispora sorghi* (Ell. and Ev.) Olive and Leferbvre. The spots, which are bordered by a deep-red margin, are elliptical, several centimetres long, about 0.5 centimetre to 1.5 centimetres in width and regular in outline. Numerous small, rough, nearly circular, black bodies, the sclerotia of the fungus, are produced within the tissues of the spots and are also partly visible on the surface.

Phyllosticta leaf-spot caused by *Phyllosticta sorghi* Sacc. The spots produced by the disease are usually oval, with yellow areas bordered by an irregular and light-red margin. They sometimes attain a length of several centimetres. In the centre of the spots, many pycnidia develop in rows. The pycnidia are formed below the epidermis and open through an aperture, releasing numerous spores in mucilaginous masses in the form of long tendrils.

Zonate leaf-spot caused by *Gloeocercospora sorghi* Bain and Edg. Dark-red zigzag or semi-circular spots are first produced on the lower leaves of the seedlings. In the adult stage of the crop, the spots appear in a zonate pattern with grey and deep-red zones alternating. The spots may also appear along the margin or near the midrib. Black and very small sclerotial bodies are produced in the tissues of the older leaf-lesions.

Leaf Blight caused by *Helminthosporium turcium* Pass. The leaf-spots produced by this disease are spindle-shaped, straw-coloured, with a slight green tinge. In severe cases, the spots may cover the entire leaf-blade, thus producing the blighting effect.

Bacterial leaf-spot caused by *Pseudomonas syringae* V. Hall. The spots are small in the beginning, but enlarge very rapidly involving a major portion of the leaf in the form of red stripes. The centres of the spots

CONTINUED ON PAGE 38

You Can't Afford to Ignore Pullorum Infection

by
S.B.V. Rao
Poultry Research Division
Indian Veterinary Research Institute
Izatnagar

MAYBE the Bacillary White Diarrhoea, or the Pullorum Infection, does not kill all the baby chicks it attacks, but the 25 to 50 per cent that survive are a greater menace: they carry the infection to the future generation.

You have reason to suspect the disease in your flock if

(1) the hatching percentage is low (due to many "dead in shell" embryos) ;
(2) from the first week onwards, the brooder chicks tend to huddle under the hover, suffer from white, watery evacuations, pasted vents and difficult breathing, and deaths begin ;
(3) the egg-yield of the flock is lowered, some hens die of yolk "peritonitis" and others have persistent watery motions.

The Pullorum Infection is caused by the germ *Salmonella pullorum.* The germ selects the ovum as its seat of mischief. It is present in the egg-producing organs (ovaries) of adult hens that contracted the disease as chicks, or even later.

From diseased ovaries, the germ passes into the yolk of the eggs laid by infected hens. The yolk remains inside the body cavity of the day-old chick to provide it nourishment for about 94 hours by slow absorption into the intestines. Thus it gains entry into the system of the chick and produces the disease. From the intestines, the germ gets into the liver and then into the undeveloped ovaries.

The healthy ovary of a hen consists of a cluster of round-shaped ova or yolks varying in size from a pinhead to the full-size yolk of a hen's egg. The undeveloped ova are small and greyish-white ; as they mature and attain the usual size, they become orange or yellow. Each ovum is attached to the body by means of a short stalk.

The affected ova, on the other hand, are misshapen and discoloured, and their attachments long and thread-like. Sometimes, the ova break in the abdominal cavity and cause inflammation of the lining ("peritonitis"), resulting in the death of the bird. Whereas the contents of a healthy ovum are of the same colour and consistency as the yolk of a fresh egg, those of the infected ones are either more fluid or less fluid and sickly yellow, greenish, or even blackish. Sometimes the sack of the ovum becomes leathery, pits on pressing and is oily. These are usually the unmistakable signs of the disease.

See the pearl-like nodules on the wall of the heart of a baby chick (*right*). The Pullorum disease has caused these

The heart also gets misshapen (*left*)

The liver gets enlarged and white areas of dead tissue appear on it

A case of "yolk peritonitis." Shown on right are three abnormal ova with their stalks

IN BABY CHICKS

The disease in baby chicks begins to appear about the sixth day after hatching, reaches the peak by the second week and thumps down by the third week. Sick chicks feel thirsty and crowd round the hover. Panting can be noticed, along with white chalky fluid motions.

On opening a dead chick, pneumonia or congested lungs can be seen. In two to three week-old chicks, the liver sometimes has greyish specks of dead area, and pearl-like nodules develop on the wall of the heart. The shape of the heart is occasionally distorted in week-old chicks.

If freshly dead chicks, preserved on ice in thermos, are sent to a Veterinary Laboratory for examination, the germs can be recovered from the heart blood or liver and in positive cases the results communicated within a week with the necessary advice to destroy the hatch and blood-test the breeders. Drugs are of little value in this infection. Some new drugs like "Neftin" and "Furazolidone" do help in curing many chicks, but there is always the danger of some of them becoming "carriers" and continuing the disease in the flock. Therefore, they are best destroyed, unless blood-testing is also done after medication to remove the "reactors."

AGGLUTINATION TEST

The presence of the germ in the body of a hen causes her tissue cells to produce substances called "agglutinins" in her blood. They form a defensive mechanism against the disease by causing the germs that invade the system to clump down when they come into contact with the (specific) agglutinins, so that the white blood cells could devour them.

The presence of these telltale agglutinins can be detected by the use of a testing fluid with killed germs in suspension. A drop of blood from the hen is taken, mixed with a drop of the testing fluid ("Pullorum antigen") on a glass slide and the reaction read. If the hen is diseased, the test CONTINUED ON PAGE 32

Healthy, round ova side by side with disfigured potato-shaped ones in the abdomen of an infected hen

Shells Can Bring More Foreign Exchange

by
Rajinder Kumar
Fisheries Development Officer
Andaman and Nicobar Islands
Port Blair

HOW shell-fishing in the Andaman and Nicobar Islands came to attain the position of importance that it deserves is quite an interesting story.

There are about a dozen species of gastropod molluscs of the genera *Trochus* and *Turbo* occurring in the waters of the Andaman and Nicobar Islands, but only two species, namely, *Trochus niloticus* Linn. and *Turbo marmoratus* Linn. are of commercial importance. These are used in the manufacture of shell buttons, buckles and other fancy goods. The natural habitat of *Turbo marmoratus* is the waters of Penang, Singapore, Andaman and Nicobar Islands, Mergui Archipelago, Australia and New Guinea. The other shell, *Trochus niloticus*, is more widely distributed but the bulk of its catches are made from the waters around Fiji Islands, New Caledonia and Australia. Germany, Austria, France, Japan and the United States of America are the countries where enormous quantities of these shells are utilized every year for the manufacture of shell products.

In January, 1927, the Tahsildar at Nancowrie (Nicobar Islands) reported to the Deputy Commissioner of Andaman and Nicobar Islands at Port Blair (Andaman Islands) that he had seen a motor-boat with a lighter in tow, manned by the Japanese, in the Nicobar waters, and that the object of their visit seemed to be collection of shells in that area. In September, 1929, the Captain of the S.S. "Ahmedi" reported to the Shipping Officer at Port Blair that he had sighted a motor-cutter near the Table Islands which was most likely engaged in collecting shells from the Andaman waters.

Accordingly, in October and November, 1929, several surprise cruises were made by the Engineer and Harbour Master at Port Blair, and he found 21 Japanese boats fishing in the coastal waters of the Andamans. On a careful search, $31\frac{1}{2}$ tons of *Trochus* and $7\frac{1}{2}$ tons of *Turbo* shells were found in the holds on board these boats. The entire collection was confiscated and the masters of the boats were suitably fined, but this did not discourage the Japanese poachers.

Fancy goods of high artistic taste made out of shells

In the absence of suitable patrolling vessels with the Andaman and Nicobar Administration to keep a check on poachers, the authorities decided to issue licences to the Japanese boats for collecting a reasonable amount of revenue from the shellfish resources. But as the conservational aspect of the problem was considered to be even more important, the Director, Zoological Survey of India, was requested to make arrangements for a detailed study of these molluscs for the proper management of the fishery.

Senior zoologists of the Zoological Survey of India were, therefore, deputed from time to time to study the various aspects of the shell fishery in the waters of the Andaman and Nicobar Islands and to suggest

suitable measures to make the industry a permanent source of revenue to the Administration. The scientists made preliminary observations on the breeding habits, age at maturity, longevity and natural enemies of these shells. Attempts were also made to study the density of population and the charting of the shell beds.

But as their observations were of a short duration, it was felt that more accurate data should be obtained to put the industry on a proper footing. Detailed observations on the shell *Trochus niloticus* were, therefore, made in the years 1932-35 and the following conclusions arrived at.

(*i*) The maximum diameter at the base of the shell at maturity is nine centimetres, which is attained in the third year. The shell grows to a diameter of

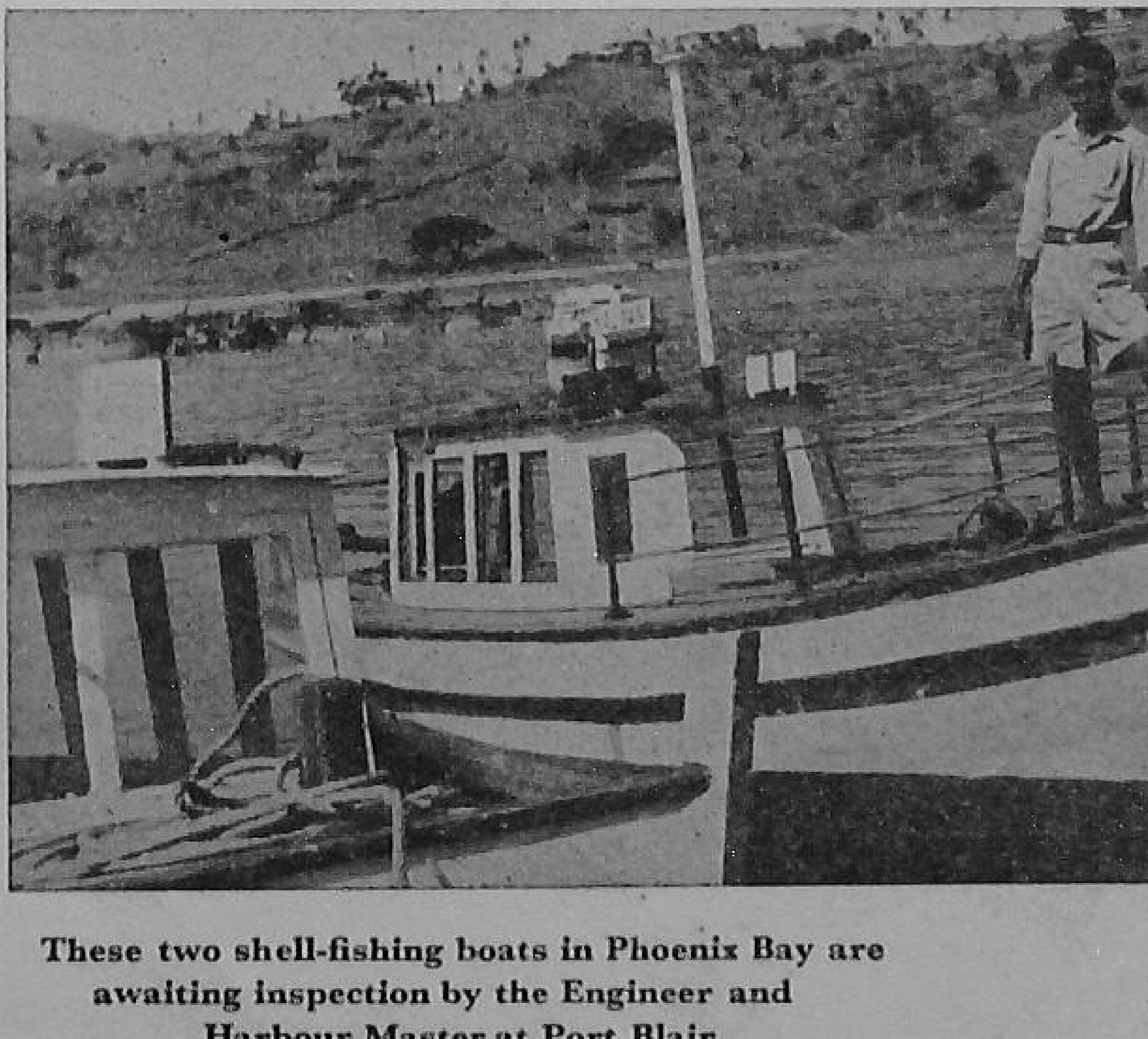
A *sampan* ready to leave for the collection ground. The two divers on the right are seen wearing the goggles

Trochus **shells spread for drying in Guitar Island**

up to five centimetres in the first year, five to eight centimetres in the second, eight to ten centimetres in the third and ten to eleven centimetres in the fourth and fifth years. Under normal conditions, the animal lives for about ten years and reaches a maximum diameter of 15 centimetres. As the shells mature when they attain a maximum diameter of nine centimetres, it is absolutely necessary that immature shells below nine centimetres in diameter are protected up to the time of full maturity, so that they may spawn at least once in their mature stage to replenish the shell beds. Thus, a maximum diameter of nine centimetres was proposed to be the minimum size limit for the fishing of these shells.

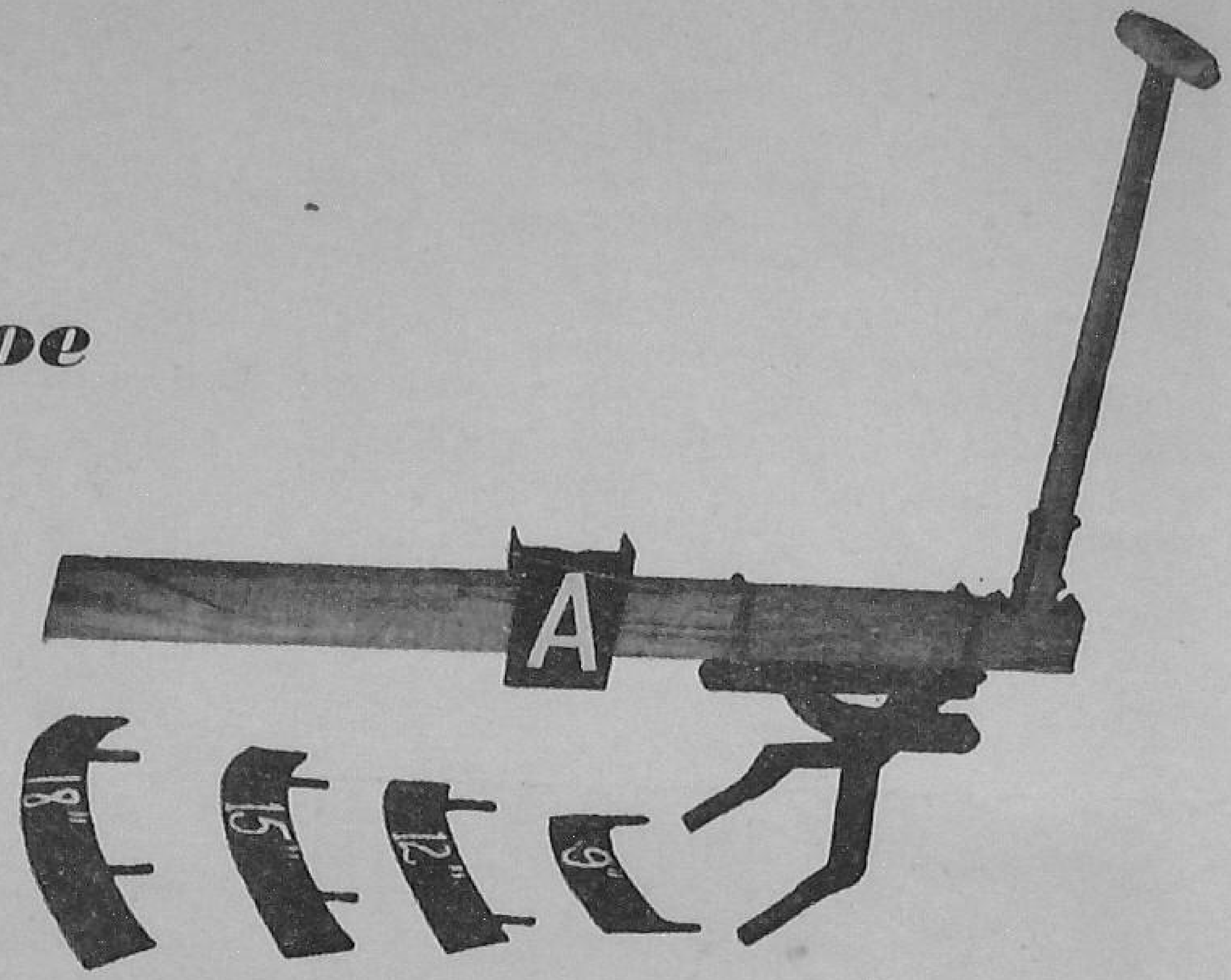
(*ii*) A study of the breeding habits of *Trochus* revealed that an intensive spawning of this shell took place from April to May, and then in October. April to September, when the sea around these islands was generally rough due to the onset of the South-west Monsoon, was proposed to be prescribed as the close season as, during this period, it was not possible to make shell collections, and, at the same time, the animals spawned intensively.

(*iii*) It was estimated that with judicious exploitation the yield from these beds could be maintained more or less stationary at 200 to 300 tons per annum. As the shell beds were found to have been indiscriminately exploited for many years by the Japanese, adoption of stricter measures to enforce the legal minimum size limit was suggested to restore the beds to their former populous condition. CONTINUED ON PAGE 38



These two shell-fishing boats in Phoenix Bay are awaiting inspection by the Engineer and Harbour Master at Port Blair

The "Anand" Hoe is a Better Hoe



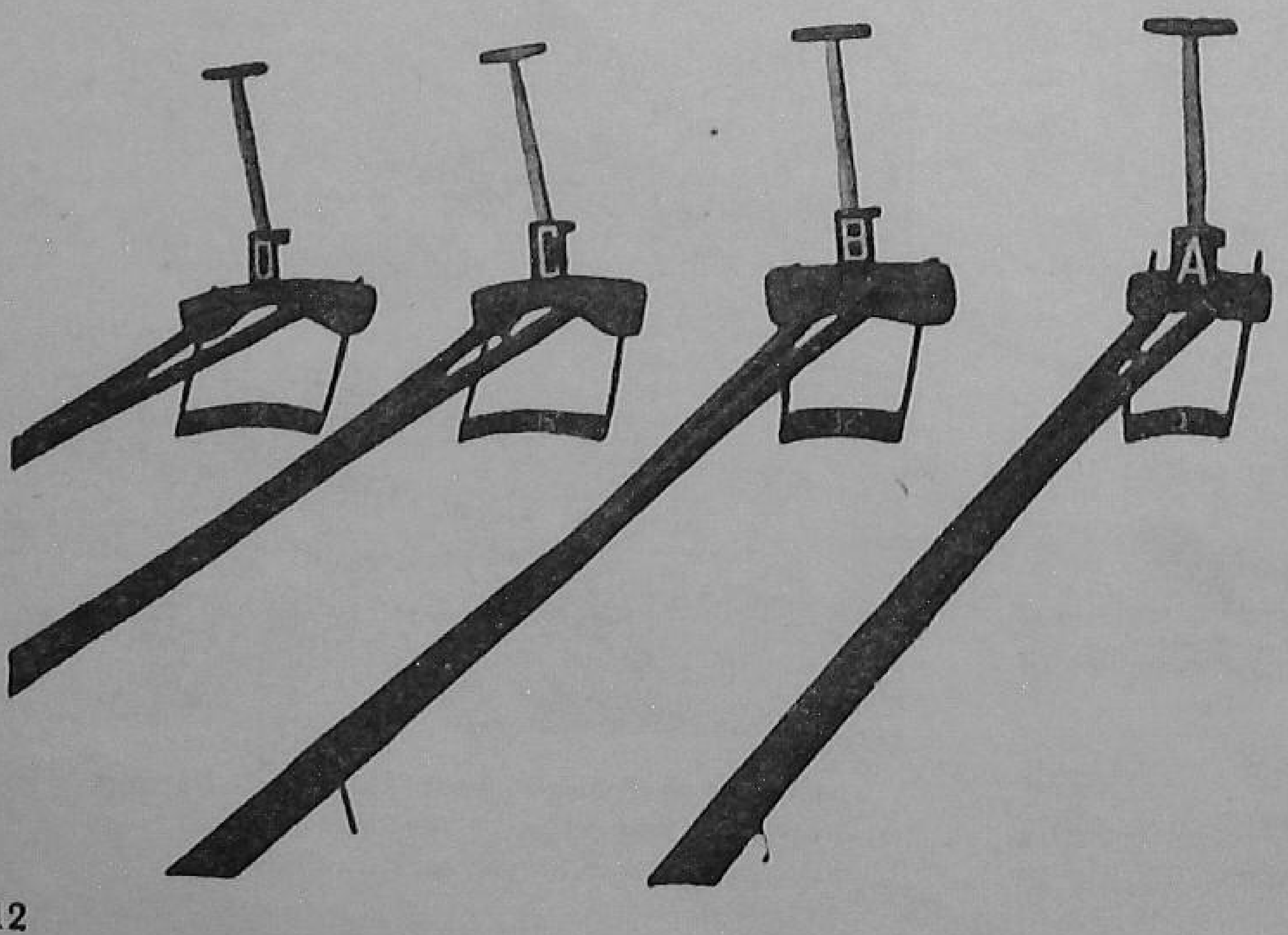
The "Anand" hoe

by
S.M. Patel
B.A. College of Agriculture
Anand, Bombay State

THE Anand Institute of Agriculture has succeeded in giving farmers a hoe which is much superior to the interculturing implements at present used by them; it is the "Anand" hoe.

The new hoe has all the qualities that go to make it attractive to the farmer. It is suitable for interculturing in crops like *bajri*, *jowar*, wheat, vegetables and tobacco—so it replaces at least four traditional hoes. It is simple in design, can be made by the village artisan and does not call for frequent repairs—so the initial as well as the maintenance cost are not much for even the ordinary farmer. It is of a sturdy build, which makes it quite durable, can be adjusted to suit bullocks of varying heights and sizes and, above all, gives a very efficient performance.

Some of the traditional hoes used by farmers



A hoe is a light type of cultivator generally used for uprooting weeds by inter-row cultivation between crop-rows. The local hoe essentially consists of a long, narrow blade with a cutting edge supported by two prongs at each end, which are fitted on to a head-piece. A handle and a long wooden beam, either bifurcated at one end or made up in a pair, are fixed to the head-piece. The implement is hitched to a pair of bullocks through the beam and is guided by the driver by means of the handle.

LOCAL HOE

The construction of the local hoe is such that only one blade of a particular length can be fixed to

it. Such a hoe has the following disadvantages.

Each unit can take only one type of blade. This necessitates the possession of a number of hoes to be used in different row-widths. For example, an average farmer growing four to five crops of different row-widths, viz., 12 inches, 15 inches, 18 inches, 21 inches and 24 inches will need at least four hoes with blade lengths of nine inches, 12 inches, 15 inches and 18 inches, respectively.

The head-piece of the hoe is always longer than the length of the blade. This makes it quite unfit for use in crops where the vegetative growth covers a certain portion of the row. This disadvantage is particularly marked in the case of tobacco wherein many leaves get damaged by the head-piece of the hoe. The farmer has, consequently, to restrict himself to the use of a much smaller hoe, thereby decreasing the efficiency of work: alternatively, he has to sustain a loss due to breakage of leaves and damage to plants.

The materials used in the construction of the hoe and the design in general are traditional and rather arbitrary; these are not based on any principles of design or strength of materials. The wooden head-piece and its joints with the beam and the handle are weak from the design point of view. Thus, there are chances of the implement snapping at these weak points.

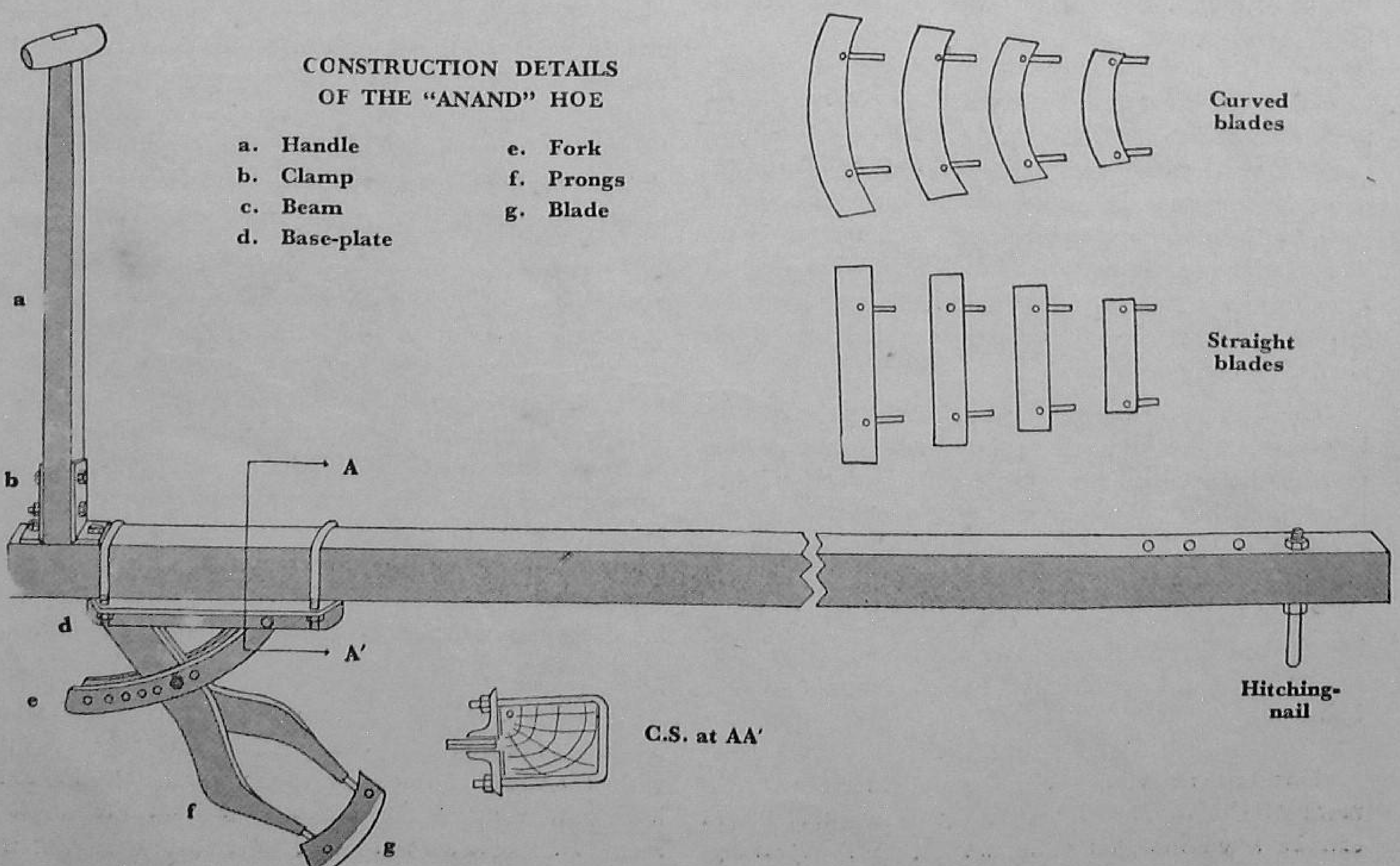
THE NEW HOE

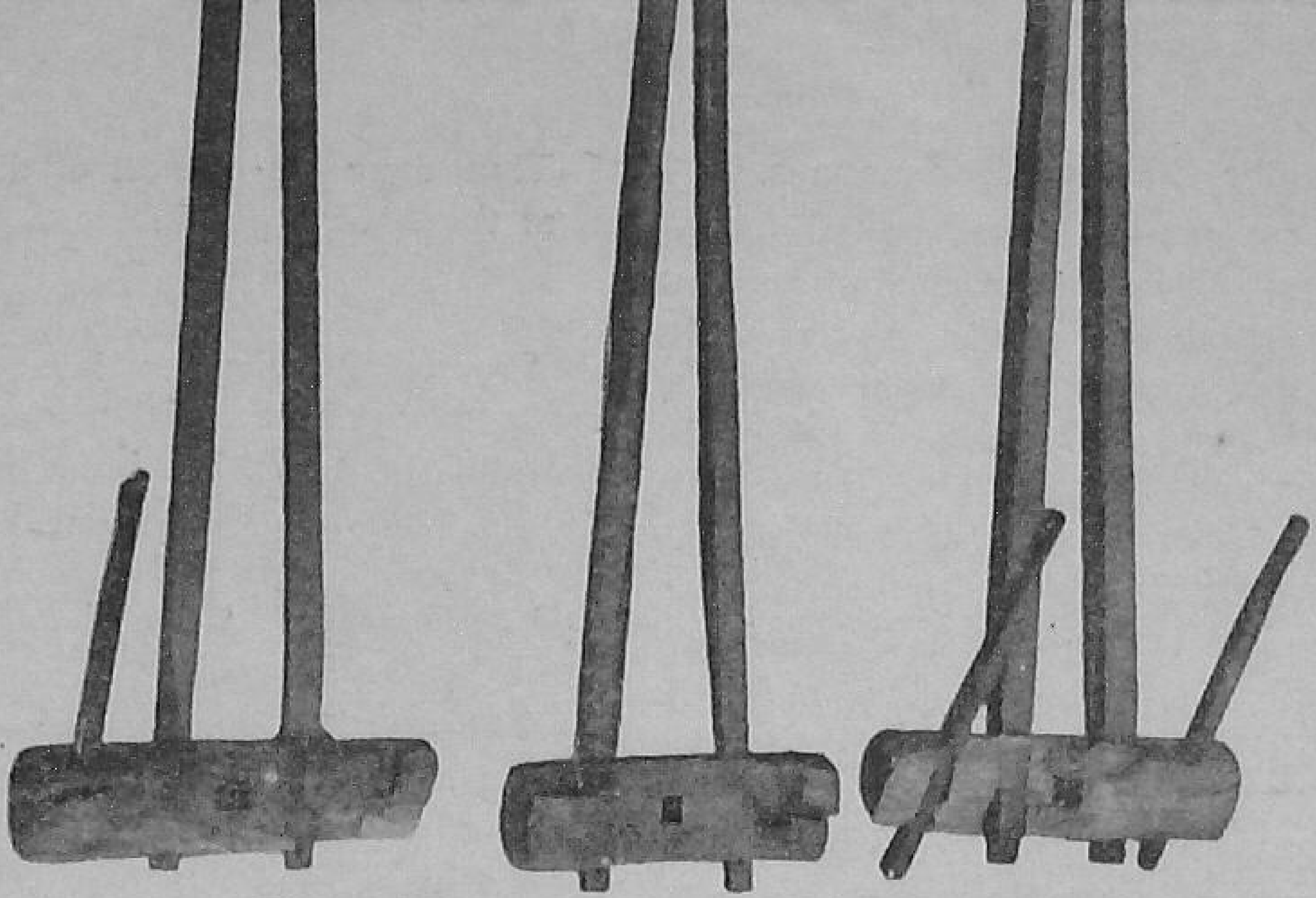
In designing the new hoe, an attempt has been made to overcome all these drawbacks. The general shape of the Anand hoe is not much different from that of the local hoe except that it has incorporated all possible advantages and is nearly perfect in its design and performance. It has, therefore, found ready acceptance by the farmer.

The new hoe is composed of (*i*) a beam or pole with a hitching-nail, (*ii*) a base-plate with U-clamps, (*iii*) prongs, (*iv*) blades, (*v*) a fork, and (*vi*) a handle with grip.

The type of wood used for beams depends upon cost and availability. Keeping this in view, the beam is prepared from the local *babul* wood of appropriate size. At one end it is fitted to the base-plate through U-clamps, while at the other four holes are drilled to house the hitching-nail.

The base-plate is prepared out of two pieces of $1\frac{1}{2}$ inches $\times 1\frac{1}{2}$ inches $\times$ 1/8 inch m.s. angles. It holds the fork at one end and the prongs at the other, both through pin-joints. Specially prepared U-clamps pass through the holes in the base-plate and hold the beam when the nuts of the U-bolts are tightened.





The weak points at which the local hoes snap

The prongs are specially designed to form an inverted Y shape when they are paired. At the top end, where both the prongs are joined together, necessary holes are provided for a suitable connection with the base-plate and the fork; at the other end, special sockets are prepared to hold the blade-pins. The distance between these sockets is kept constant.

The blades are prepared in different working lengths. All the blades are fitted with special blade-pins in the central portion, keeping the distance between the two pins constant for all the blades. Due to this provision, a blade of any working length can be fitted on the prongs of the hoe. The blades are slightly curved, having a convex edge. They are shaped in such a way that the edge remains in one plane at a particular angle of work which is the most common in use. The curvature helps in pushing the rubbish material towards the ends, which otherwise would stick to the edge and reduce the efficiency of work. The blades are either prepared from special steel or from ordinary mild steel, subsequently case-hardened to obtain a hard core to reduce wear and tear of the blades to the minimum.

The fork for changing the angle is attached to the base-plate at one end and to the central portion of the pair of the prongs at the other end, both the joints being pin-joints. At this end, a few extra holes are provided so that any one can be used according to the angle of work desired.

The handle is prepared out of local wood and is identical in shape to that of the local hoe. It is fitted to the beam directly through two L-clamps and four bolts.

WHY SUPERIOR

Due to the special facilities provided for the attachment of blades, any blade of suitable working length can be fitted into the same unit. Broadly speaking, any of the blades having a length of nine inches, 12 inches, 15 inches and 18 inches can be fitted on the Anand hoe. Thus, it helps to replace four traditional hoes costing about Rs. 60. The farmer has, therefore, to keep only one unit in place of four local units. This saves a considerable amount of capital and maintenance cost as well as storing space.

It is an established fact that the draught, depth of cut and turnover of the soil depend on the angle of work, which has to be adjusted according to the different soil and crop conditions under which hoeing is done. The traditional hoe has the beam and the prongs rigidly fixed to the head-piece, giving no chance to change the angle of work; in the Anand hoe, special facilities are provided in this respect. Thus, the Anand hoe provides an extra facility for selection of the desired angle of work, which leads to increased efficiency and perfection in the quality of work.

The head-piece provided under the beam of the Anand hoe will cause no damage to crops that have a spreading habit of growth. Actually, the whole structure of this hoe is such that it does not interfere with the crop plants at all. On account of this facility (*i*) interculturing can be done on wider strips in rows, increasing the efficiency and perfection of work and (*ii*) crops can be protected from unnecessary foliage losses that may affect their yields; this advantage is marked in the case of tobacco in which the ordinary hoe does damage the leaves either by breaking the same from the petiole or tearing them at the edges.

The beam is without any bifurcation and hence is not reduced in cross-section at the joint with the head-piece, as is done in the traditional hoes. In view of the forces acting on the implement, all the structural CONTINUED ON PAGE 39

A. I.

Will Aid

Poultry Farmers

by
M. Bettiah
Poultry Development Officer
Mysore

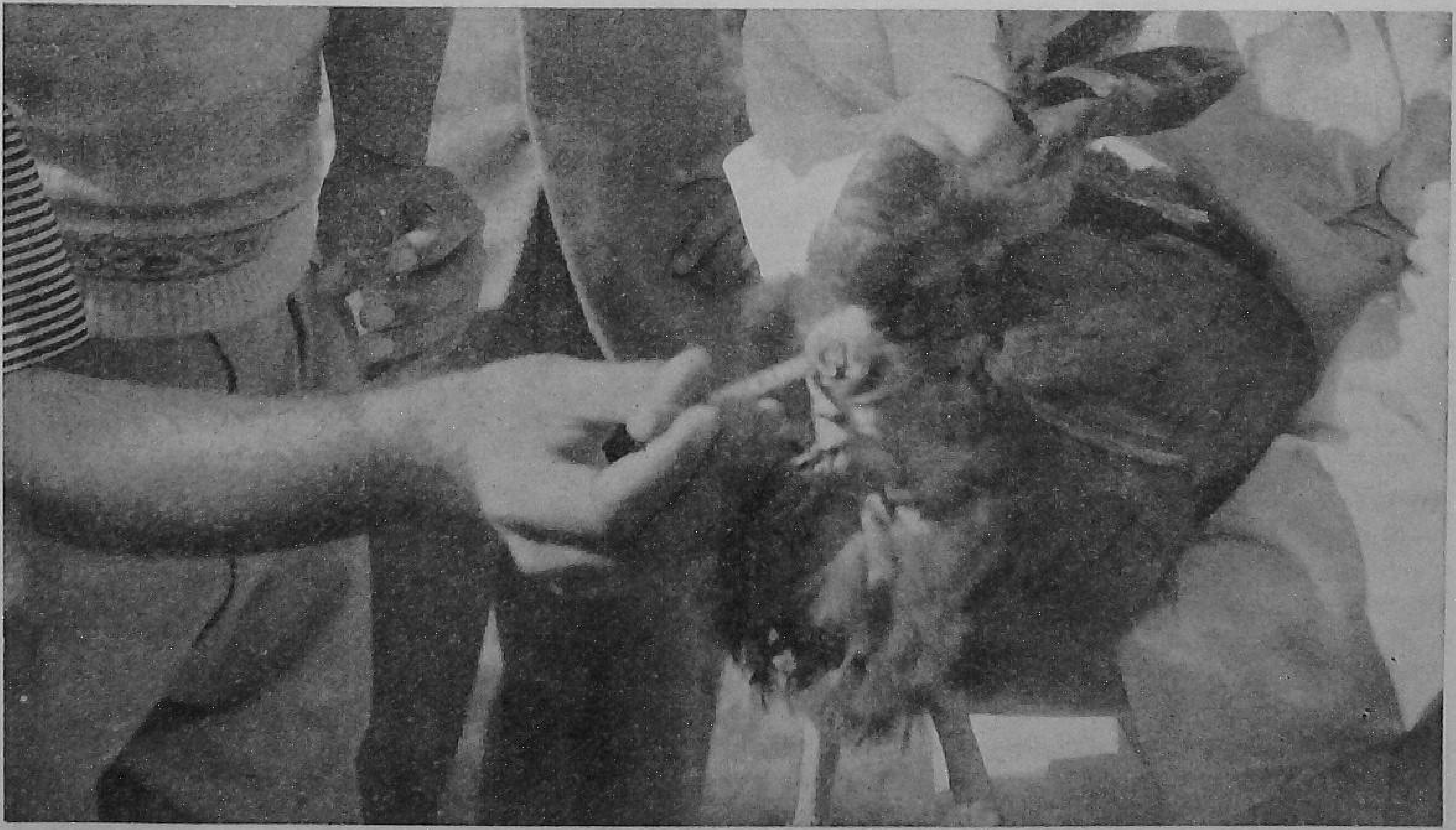
ARTIFICIAL insemination has already come to poultry, and the advantages offered by it are many.

With proper feeding and management, artificial insemination would be a good supplement to natural mating to increase fertility in poultry flocks; a 20 to 25 per cent increase may not be too much to expect. It can be used with the greatest economic advantage in turkeys, as low fertility is a problem in breeding them by the natural method.

Artificial insemination can even be relied upon as the sole method of breeding, the males being never placed with the females. Depending upon the breed, one male is sufficient to fertilize the eggs of 30 to 40 females. That would mean a less number of breeding males to be kept and no necessity of special breeding pens. Quite a saving in feeding costs, space, building materials and labour!

In pedigree breeding and progeny-testing, there is also the obvious advantage of making use of an outstanding cockerel or a proven cock. In cross-breeding, the physical difficulties often met with in mating heavy breeds with light ones are overcome. The technique is also useful: in the production of chicks from birds kept in laying batteries; in the multiple shift system of breeding—a greater control leading to less wastage of

Inserting semen into the oviduct of the hen



The only two things required are a glass tube and an ordinary ink-filler

eggs between each switching of males; for reducing infertility due to defective mating behaviour; for doing away with the problem of preferential mating; for preventing damage to the females in natural mating, especially in the moulting season.

The technique of artificial insemination as applied to poultry is known as the "Massage Technique," and is not a very difficult one. However, it does require a lot of practice to acquire the necessary skill for practising it. It involves two things: collection of semen from the males and insemination of the females. It is being regularly demonstrated to poultry breeders and students of poultry husbandry at the Hesarghatta Poultry Farm in Mysore.

COLLECTION OF SEMEN

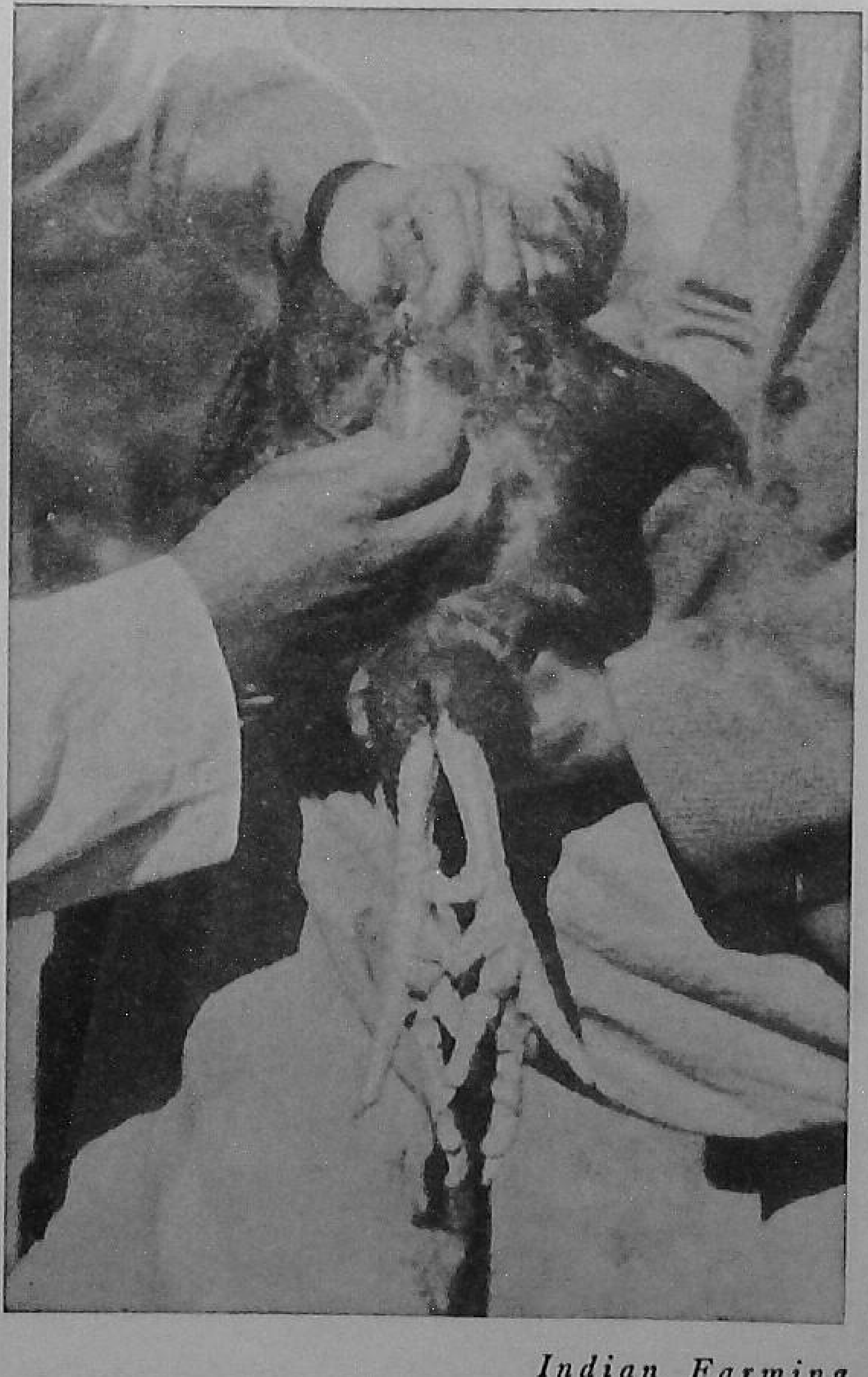
Two persons are required—one to hold the bird and another to massage and collect the semen in a glass bulb. The cock bird is held by its thighs loosely with the left-hand fingers and is rested on its breast in a horizontal position on the left thigh of the person holding the bird, its vent facing the other who would collect the semen. The correct holding of the bird is important.

The holder of the bird then gently strokes the back of the bird towards its tail five or six times to cause stimulation. The one who is to collect the semen holds the semen-collecting glass bulb in between the thumb and the forefinger of his right hand: at the same time, he slightly massages the abdominal region immediately below the pubic bones. His left-hand thumb and the forefinger are placed from the top above the vent of the cock for squeezing the semen from the bulbous ducts. In the process of stroking the back and massaging the abdominal region below the pubic bones, the bird gets stimulated and its rudimentary copulatory organ is fully everted.

The final step is the actual milking process. The left-hand thumb and the forefinger are slowly slid downwards along the vent and the collection bulb is brought into place from below, and the semen collected. The process may have to be repeated once or twice to collect the required quantity of semen. When all the semen has been collected the bird is released.

The cocks that are used for collection of semen are to be kept in individual cages for easy handling and to prevent fighting among themselves. For increasing the longevity of the cock and for a long-term programme, semen is collected every alternate day, the quantity depending upon the breed and the individual cock. In light breeds, like the Leghorns and Black Minorca, 0.5 ml., and in heavy breeds, like the Rhode Island Reds, CONTINUED ON PAGE 31

This is how you collect semen from a donor



Spoonbills and openbills nesting in the Vedanthangal heronry

GOOD CROPS WITH BIRD GUANO

by

P. J. Sanjeeva Raj

Madras Christian College, Tambaram

IT is remarkable that though we have little information on the agricultural use of bird guano, the villagers of Vedanthangal in Madurantakam taluk of Chingleput district of Madras State have been manuring their paddy crops with it since at least 1798. The heronry at the village is the oldest bird sanctuary on record in India, and its preservation to this day is entirely due to the protection to birds offered by the villagers. Special watchmen are employed by the village *panchayat* to guard the sanctuary when the birds come and breed there in large numbers during winter.

The heronry is only a temporary irrigation tank of about 74 acres, entirely dependent on rain water. There is a grove of about 540 trees of *Barringtonia acutangula* (Indian oak, Tamil *kadapai mazham*) in the middle of the tank, with a few of them growing along the tank bund. These trees are particularly well-suited for the nesting of large water-birds of various kinds, like openbills, cormorants, grey herons, night herons, pond herons, white ibises, darters, etc.

After a good monsoon, the tank may be 15 feet deep in the middle, so the birds are beyond the reach of human beings or predators, except kites and water-snakes. The birds, especially cormorants, openbills and night herons breed here in thousands. They arrive usually in batches just when the tank begins to fill up after the monsoon from September to November, nest and breed during winter and desert the place before the tank gets dried up by about April.

By about November-December, when all the birds would have just come and settled down, the water in the tank is mere muddy rainwater. Slowly, it acquires a green tint because of bird droppings falling into it ; by about February, it gets saturated with the bird excreta and develops a deep olive-green colour, an oily appearance and a strong foul odour.

This guano-saturated water, strangely enough, is drunk not only by cattle but also by men occasionally with no ill effects. The water is so foul-smelling in February that it attracts snakes in the vicinity. The

water is drained through five sluices to the surrounding paddy fields on the southern and south-western sides and nearly 128 acres of wet land, where paddy is the main crop, are irrigated with it. It is said that a higher rate of revenue used to be collected from the lands irrigated by the guano-concentrated water.

TWO CROPS

Two crops of paddy are usually raised on these lands—one from July to December and the other from January to May. The water-dissolved guano is so valuable for paddy that no other manure whatsoever—neither the usual green manure and oilcake nor the superphosphate and ammonium sulphate, etc. —is used.

But since the first crop is planted in July when no birds would have yet come to the sanctuary, all the early stages of the crop get merely the rain water collected in the tank with no guano in it. Hence, those who can afford, use a little green manure or oilcake for the first crop alone, but the majority use nothing at all.

Night herons breed in thousands at the Vedanthangal heronry

Especially the second crop, since it is planted in January when the tank water is saturated with guano, not only needs no other manure but also shows an appreciable differencein the average yield per acre over the first crop, as seen below:

The first or second crop with oilcake and superphosphate alone (no bird guano at all) in similar type of soil in the same village	3,000 pounds
The first crop with a dilute concentration of bird guano for only the later stages of the crop	2,250 ,,
The second crop with guano-saturated water for all stages of the crop	3,250 ,,

Moreover, the crop raised with bird guano as manure is much more luxuriant, and about 4½ feet tall; it definitely has a better growth than one raised with superphosphate and oilcake which attains a height of only about three feet in similar type of soil in the same village and irrigated by the Madurantakam and Valayapattur tanks, respectively.

Besides, the owners of the irrigated paddy lands are relieved of the burden of purchasing organic (bulky and concentrated) and artificial manures worth about Rs. 200 per acre every year. This means quite a saving for the ordinary farmer. Moreover, the labour of collecting, transporting and distributing the manures over the whole field, as in the case of green manures, is saved.

RICH COMPOST

There is yet another economic and equally important aspect. It is only one part of the guano, the "soluble guano," which gets dissolved in the water, that is used for paddy. The other part, the "guano-leached," which is insoluble in water, gets deposited in a thick layer on the bottom of the tank. To this get added enormous quantities of *Barringtonia* leaves, decomposing bodies of dead chicks and adult birds, egg-shells of the thousands of breeding birds, their fallen feathers, innumerable gastropods like *Limnaea* and *Planorbis*, their shells, etc. All these decompose under-water for about three months at least, forming a thick deposit of a very rich organic compost in the tank bed, sometimes four or five feet thick in the middle. The villagers are allowed every year, after the tank dries up in April, to collect this compost free of charge for the use of their dry lands on the northern and eastern sides of the tank and elsewhere, where usually groundnut, *ragi* and pulses are grown.

CONTINUED ON PAGE 40

King-size sweet potatoes that made up the 600-ton-a-*mou* yield obtained by the Hanchiawa People's Commune

Farming Elsewhere

WHAT I FOUND NEW IN CHINESE AGRICULTURE

by
Dr. Panjabrao Deshmukh
Union Minister for Agriculture

MANY have observed that Chinese agriculture even before the liberation was of a high order. The yields were by no means low although they were not as high as those in Japan. But to see in actual practice the way the Chinese cultivate their fields was quite a revelation to us. Firstly, the Chinese cultivation is very clean. The Japanese are well-known for obtaining high average yields and they sometimes style agriculture as horticulture. The Chinese agriculturists, in fact, are not any degree less careful, probably more. Whereas the Japanese sow everything in lines and often in

Abnormally tall—ten to 12 feet, tobacoo crops raised in China have multiplied their tobacco yields

Alongside ploughing, hea

cross-rows, the Chinese appear to do it regularly and almost everywhere. There are not only rows lengthwise, but the spacings between plants cross-wise are also uniform. The Chinese fields are, therefore, a very pleasant sight to see.

Besides this pattern-sowing, the fields are generally, and in respect of many crops, subdivided into smaller parts at very regular distances, usually from six to eight feet. Between these two parts, a space of about 15 to 20 inches is left open. This is so, not only with respect to cultivation of vegetables but also in the case of ground nuts, soyabeans, maize, cotton and wheat. The amount of care with which this sowing is done astonished me. We saw some fields which were just being prepared for sowing wheat. It was a very delightful sight to see the very regular and highly artistic way in which the water channels were made and the division into regular but smaller plots of the whole area was done. The width and depth of the channels were uniform and even the sides of the channels and subchannels were prepared with meticulous care. The soil on the sides of the channels was not just irregularly heaped up, as is usually the case, but very carefully and properly pressed into definite shapes.

Throughout our journey, we hardly saw a field growing vegetables which was not planted on a raised, curved bed. There was uniformity even in the dimensions and shape of these beds. The breadth was about seven to eight feet with some two feet deep channel for irrigating it on both sides. All vegetable plants were sown in lines which were the same horizontally, not only on each particular raised bed but also throughout the field. Again, every possible piece of land was put to excellent use, including small bits very close to the sloping sides of the road or the railway line. We saw in quite a few places vegetables and flower trees planted by the side of the pavement itself, and that too in cities like Shanghai and

A sugarcane crop rising to a height of nearly

ing is done layer by layer

Canton. There was not the slightest indication of anybody tampering with these growing plants in any way.

ENTIRELY NEW

What is entirely new in Chinese agriculture is the introduction of deep ploughing since the last couple of years. We have not been able to ascertain how this idea originated, although we were told that the subject was hotly discussed for a couple of years or so However, the whole of China is now engaged on this task on an extensive scale. The target of deep ploughing in respect of only the wheat crop and in only one of the 29 Chinese Provinces is said to be of the order of 5.3 million hectares for the sowing of winter wheat this autumn. This deep ploughing is intended to be the most vital item to ensure that the winter wheat crop will top the all-time record which the Chinese people have reaped last year. It was pointed out that the peasants have already deep-ploughed two million hectares of wheat lands to a depth of one-third of a metre, i.e., nearly 14 inches, after 20 days and nights of vigorous effort. The Chinese claim that deep ploughing when carried out with a heavy dressing of manure adds to the fertility of the soil and helps it retain the moisture and air needed for plant growth. We may note here that on the whole the soil in China is very soft. This may be due to the peculiar nature of the soil and the fact that the rainfall in China is spread over the whole year.

The Chinese people have very few cattle and thus all the farmers cannot utilize them for ploughing. The work has, therefore, to be carried out almost wholly with the hands. Mostly this is done by digging with spades, but in some places some new contrivances for ploughing have been evolved. Power used, however, is purely human labour. One of the devices which we personally saw was a wooden plough with an iron share being pulled by an ordinary coir sort of rope from a contrivance fixed on the border of the field with four persons turning it round. On this they engaged as many as ten people. Whether it is ploughing by human

ecessitated topdressing by scaffolding and ladders

Ten-kilogramme sugarbeets

A lakh of people are said to be daily engaged in deep ploughing being carried out by the Hsiang Cheng People's Commune. The ploughing that is being done here is of a high-yielding plot which they wish to dig to a depth of 14 feet. The crop growing in the background is tobacco

power or with the help of buffaloes or cows or bullocks, deep ploughing is done in layer after layer. Ploughs, as well as carts, etc., are sometimes pulled by one animal and sometimes by two. After ploughing once all the loose soil is removed by men and women with spades and then the plough goes over it a second time and so on, the operation of ploughing and removing the loose earth being carried out as many times as necessary till the required depth of ploughing is reached.

The Chinese people did not seem to possess many tractors although some were seen here and there. Whatever tractors we saw were as a rule old and rather exhausted. We learnt that Soviet Russia was intending to send them a lakh of tractors very soon. But, for the time being, they are depending more on their own hands and the few draught-cattle that they have. The Chinese Government and people are, therefore, laying the greatest stress on deep ploughing at various depths, because they feel convinced that this leads to unprecedented yields.

One or two other things that they do after deep ploughing are: (a) mixing the ploughed loose land with manure and spreading it layer after layer and (b) putting in hollow bamboos at various places so as to permit the gases from the soil to escape and to let in fresh air. These bamboos are not put in too closely but at fairly long distances. They were not very easily noticeable.

HIGH SEED-RATE

The second entirely new and novel feature of Chinese agriculture is the increased seed-rate. While I have preached a reduction in the seed-rate of paddy from the traditional maund or one and a quarter maunds per acre to only about one-twelfth or one-tenth of it, there is a positive drive for increasing the seed-rate in China, especially with respect to wheat and paddy. Of course, this higher seed-rate is recommended for deep-ploughed fields and not so much for others. On the strength of deep ploughing, with of course a few other things already mentioned above, the Chinese claim extraordinarily high yields the like of which has never been heard of in the world before. In one field near Hsien Chen, one-sixth of an acre, which is called *mou* (pronounced moo), the Chinese farmers are said to have produced 1,20,000 catties (a catty is equal to 1.1 pounds). This will give a per-acre yield of (1,32,000×6) 7,92,000 pounds or over 350 metric tons. In another plot, they claim to have got 1,06,700 catties or 1,17,370 pounds per *mou*. They pointed out many fields in which they obtained lesser but still unusually

Four Chinese children standing on a very thickly planted paddy crop raised on an experimental plot of 1.01 *mou*

high yields. As a result of all this, the average production in 1958 as well as the total, they say, went up to nearly double that of 1957.

Consistent with the above practice of increased seed-rate they have asked farmers to put in 50 per cent more wheat seed than usual. Even cotton was planted not only in rows but in squares, but the spacing was fairly liberal and comparable to our own. In fact, in many places the Indian seed-rate may be much higher than that of the Chinese. We did not hear of any drive to increase the rate of cotton.

COLOSSAL YIELDS

In the plots where the above colossal paddy yields were obtained, it was pointed out that in addition to deep ploughing the following items were practised:

(1) the water was changed every day;
(2) repeated doses of fertilizers were given every week or ten days;
(3) there was also spraying and dusting at the same intervals; and
(4) even artificial respiration through electric lights was provided.

High yields are claimed in respect of all crops and the average per-acre yields from the available data for 1956, 1957 and 1958 are as follows:

	Pounds per acre		
	1956	*1957*	*1958*
Paddy (rice)	2,178.00	2,362.80	3,960
Wheat	798.60	752.40	1,320
Potato	1,749.00	1,834.80	—
Soyabeans	745.80	693.00	1,135.20
Cotton	203.28	250.14	528.00
Jute and hemp	1,643.40	1,854.60	—
Tobacco (cured)	910.80	633.60	—
Sugarcane	34,452.00	34,303.50	—
Sugarbeet	9,807.60	8,289.60	—
Peanuts	1,135.20	890.34	2,178.00
Rapeseed	374.88	336.60	481.80

The yields of tobacco also are claimed to be many times more than those in India. It seems they have grown tobacco plants to a height of nearly ten to 12 feet. We did not, however, see the tobacco crop anywhere we went. Probably, it was already harvested or the area where tobacco is grown was different.

The sugarcane yield claimed is 225 tons per hectare, which is said to be a dozen times that of 1957. In

India also we have been able to obtain well over a 100 tons per acre in the South, especially at Walchandnagar in Bombay State. Their claim here, therefore, appears fully believable.

In the case of sweet potato, in the Hanchiawa People's Commune in Tinghsien County, Hopei Province, an excellent crop of sweet potatoes was reaped last year on 5,673 hectares of land. The per-hectare yield from a *mou* of land is said to be 600 tons.

A very thickly planted paddy crop, we were told, averaged a yield of 277.17 tons per hectare on 1.01 *mou* of experimental land. The amazingly high yield was attributed to the application of pioneering farming methods including deep ploughing, close-planting and use of abundant manure. The land was tilled ten times before sowing and ploughed to a depth of one-third of a metre. The rice plants stood close to one another and yielded a total of 7.68 million ears per *mou*. Fertilizers were applied five times. A total of 1.5 tons of green manure, 70 tons of fertile soil, 52.5 kilogrammes of ammonium sulphate, 40 kilogrammes of super calcium phosphate, 90 kilogrammes of bean cake and three tons of natural manure were used. Since the thickly transplanted rice shoots allowed no room to step in, the co-operative members mixed the fertilizers with water and pumped them on to the field by tubes.

REGULAR SPRAYING

The Chinese farmers also do not wait for pests to break out before spraying and dusting. In most places, they do these regularly and frequently. Similarly, they also administer doses of fertilizers with equal regularity.

So far as the cotton yields in terms of lint are concerned, we were told, when we visited a commune which was the headquarters of a county, that the pre-liberation average was only 19 catties or 20.9 pounds per *mou*. In 1957, this rose to 58 catties or 63.8 pounds per *mou*, but in 1958 there was an average increase of 200 per cent over the yields of 1957 in the county. We could not personally verify it but there is no doubt that very spectacular and unusually high yields have been obtained by the Chinese.

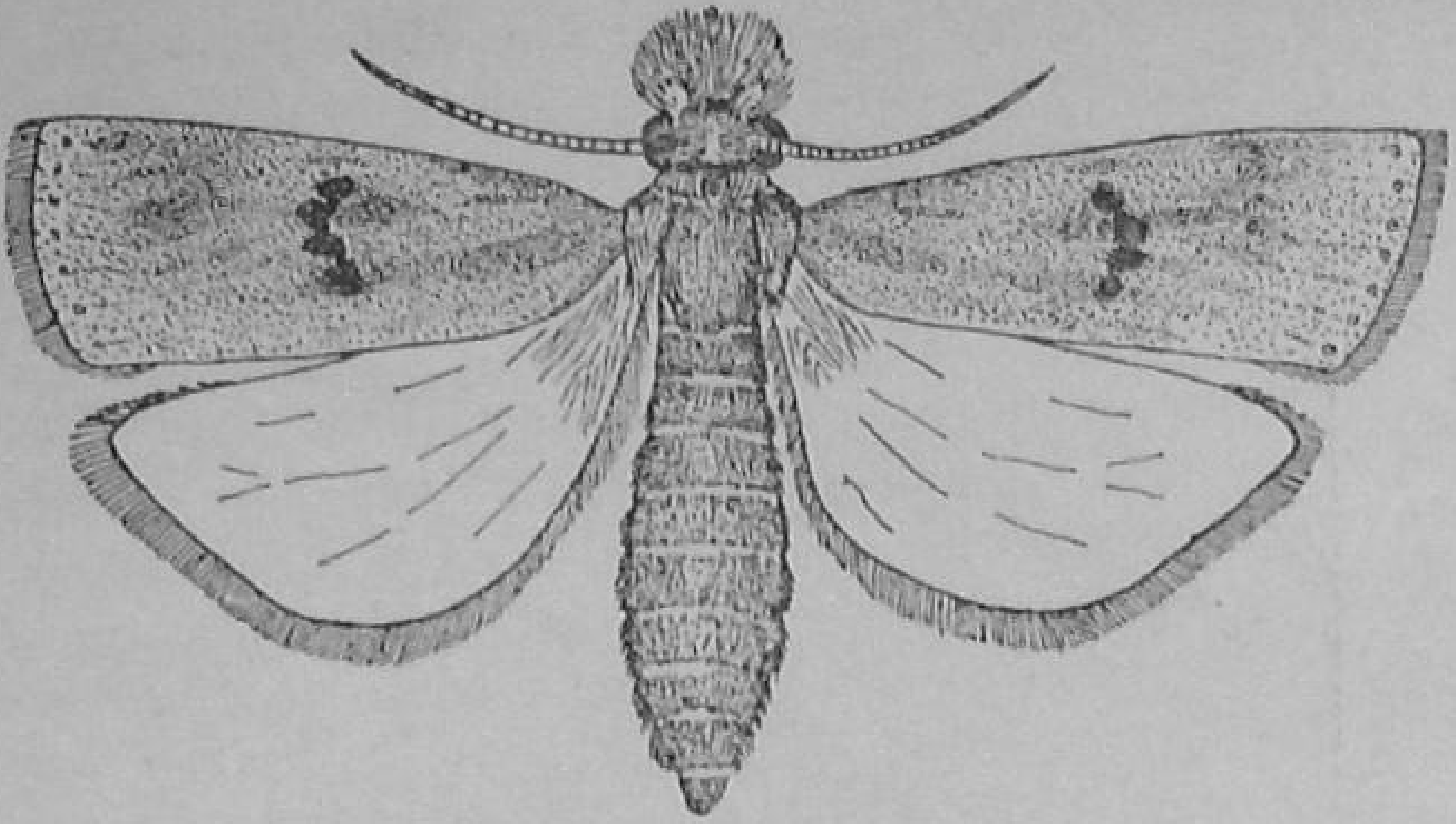
One of the things which we have not been able to resolve was whether the Chinese soil and climate are not very propitious for tillerings, or whether the absence of many tillerings was the result of too close a transplantation. When we went to a field which had been harvested and the yield was claimed to be 30,000 catties per *mou*, we had asked as to how many seedlings they had planted on each hill. We were told that unlike the usual method of planting four to five seedlings here, they planted eight to ten, reducing the spacing also to two to three inches. Now, when we counted the number of stems in the harvested field it did not go very much beyond ten, which made us believe that there had been little or no tillering. I do not, however, propose to hazard any opinion before getting some more information on the point.

But what I think we ought to do is to undertake intensive experiments in the same way as the Chinese have done, in at least a dozen areas of our country, practising the various things, such as ploughing the soil at different depths, using irrigation water as often as possible, mixing the soil with manures and fertilizers at the time of ploughing, increasing the number of seedlings and reducing the spacing, using insecticides and weedicides, top-dressing heavily and regularly, providing artificial respiration, etc. These items should be tried in their various permutations and combinations.

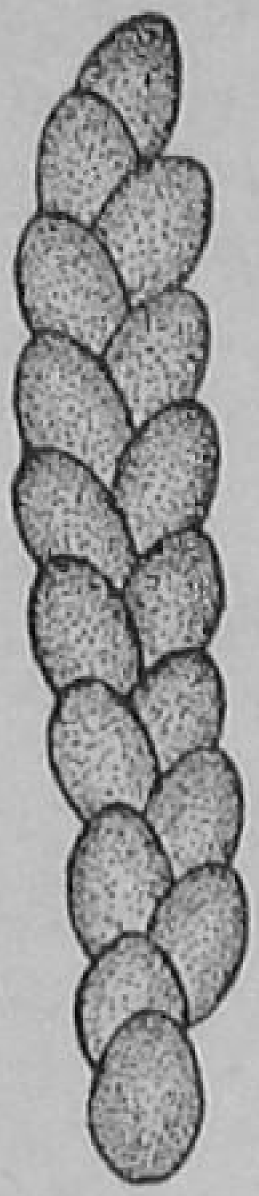
I would like, however, to say positively that even if the Chinese method is found suitable, it need not be taken to discredit the Japanese method. People should, in fact, be informed that till we come to any different conclusion we must stick to the Japanese method. It might very well be that whereas the Chinese method is suitable in some places, the Japanese method would continue to be ideal in other areas. I have been told by the Chinese people that the deep ploughing and the intensive seed-rate could be expected to give high yields only in areas where irrigation facilities are available in plenty. Of course, the Chinese farmers have not to worry about rats and sparrows, crows and other birds. Hardly any of them was noticeable anywhere, much less a monkey or even a dog.

I had asked the Japanese experts for their opinion on the increased seed-rate giving better results. They considered this improbable and the Chinese figures unbelievable. However, it is not unlikely that they may also try the Chinese method in their research centres. The Japanese seed-rate is about the same, if not lower than what Indian farmers put in under the Japanese method, viz., 12 to 20 pounds.

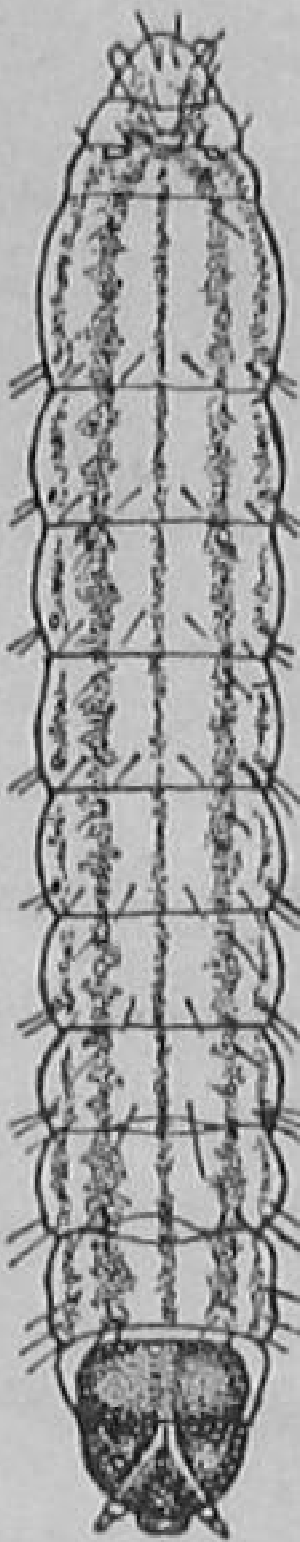
The Japanese also are very pleased with their harvests. In spite of 22 typhoons, which visited Tokyo last year causing serious damage to houses and old walls and buildings, they reaped their fourth bumper harvest. Combined with a steady and fixed price to the growers extending over the whole of this period, the Japanese farmer has become quite prosperous. One of the factors the Japanese mentioned as contributing to better yields was proper attention to drainage. The Chinese deep-ploughing may probably be affording this advantage to the crops they have grown. This may, I think, be borne in mind by Indian research workers also.



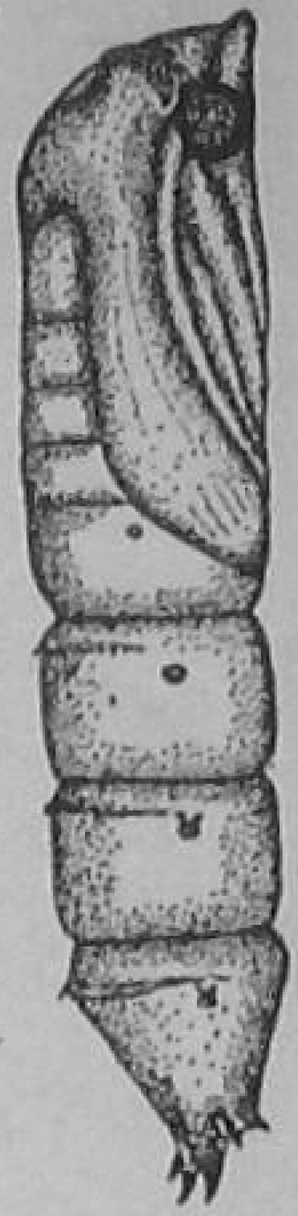
A female moth



Eggs



A caterpillar



A pupa

A New Borer on Paddy

by

M.R.G.K. Nair

Agricultural College
Vellayani, Kerala State

A NEW, potent enemy of paddy has made its appearance in India. It is the stem borer *Proceras polychrysa* Meyr. It was first observed in Trivandrum district of Kerala State in 1956, where it has already lined up with the major pests of paddy and has a field-day from July to January. It attacks the paddy crop in all its stages, and is capable of causing a 50 per cent loss.

Proceras polychrysa is a major pest of paddy in Malaya. In India, at present it seems to be restricted to the southern regions of Kerala State. But it is quite likely that it may extend its area of acti ity in the country and get established as a major pest, as in Malaya.

Its peculiar habits make *Proceras polychrysa* the most destructive of the paddy pests. The caterpillar first tunnels into the outer leaf-sheaths and then enters the deeper tissues. In this wav, it brings death to the whole plant, as different from the death of the central shoot alone caused by the *Schoenobius* caterpillars.

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Several caterpillars attack a single plant. After making short work of it, they shift to the nearby plants which meet the same fate. This leads to a complete destruction of all the plants in a clump within a short period, and the tillers do not get time to grow out.

Besides paddy, the pest has also been found to attack *Panicum cruss-galli*, a weed of the paddy fields.

The adult is a small, slender-built moth with brownish-yellow forewings bearing a short row of black, shining and raised spots in the middle and a row of minute golden spots along the outer margin. The hind-wings are white. The eggs are laid on the leaves. They are white, flat and arranged like the scales on the body of a fish, overlapping one another.

The eggs hatch in six days. The hatched out larvae first bore into the outer leaf-sheaths and then tunnel within to feed on the internal tissues.

The full-grown caterpillar measures about 21 millimetres in length, is cream-white in colour with deep

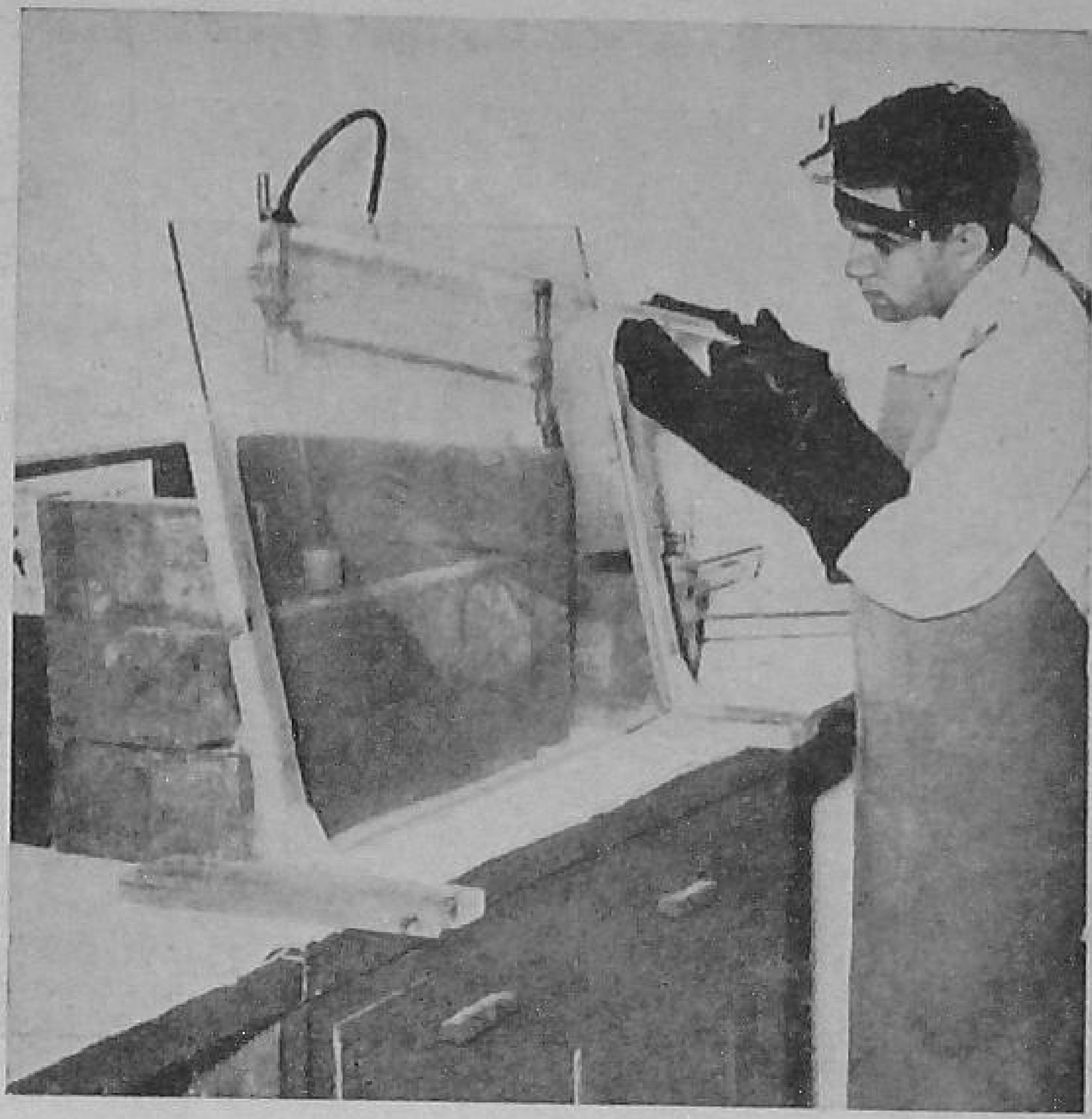
This is what happens to paddy plants when *Proceras polychrysa* attacks them. A healthy plant on right highlights the difference

brown to black shining head and prothorax. The body is striped with five longitudinal light brown stripes: one dorsal, two subdorsals and two laterals. The larval period is 23 to 36 days. Pupation takes place within the larval tunnel, the pupal period being four days. The adult emerges through an exit hole previously made by the caterpillar for the purpose.

Preliminary trials have shown that the pest can be controlled by spraying with "Endrin" 0.05 per cent or "Folidol E 605" 0.08 per cent. For an effective control, it may be necessary to spray the crop once during the nursery stage and once or twice after transplantation. Of the above two insecticides, "Endrin" 0.05 per cent has been found to be more effective.

DISTINGUISHED VISITOR

The Prime Minister of Ghana, the Hon'ble Kwame Nkrumah (*left*) who recently visited India, is seen here at the Botany Museum of the Indian Agricultural Research Institute, New Delhi



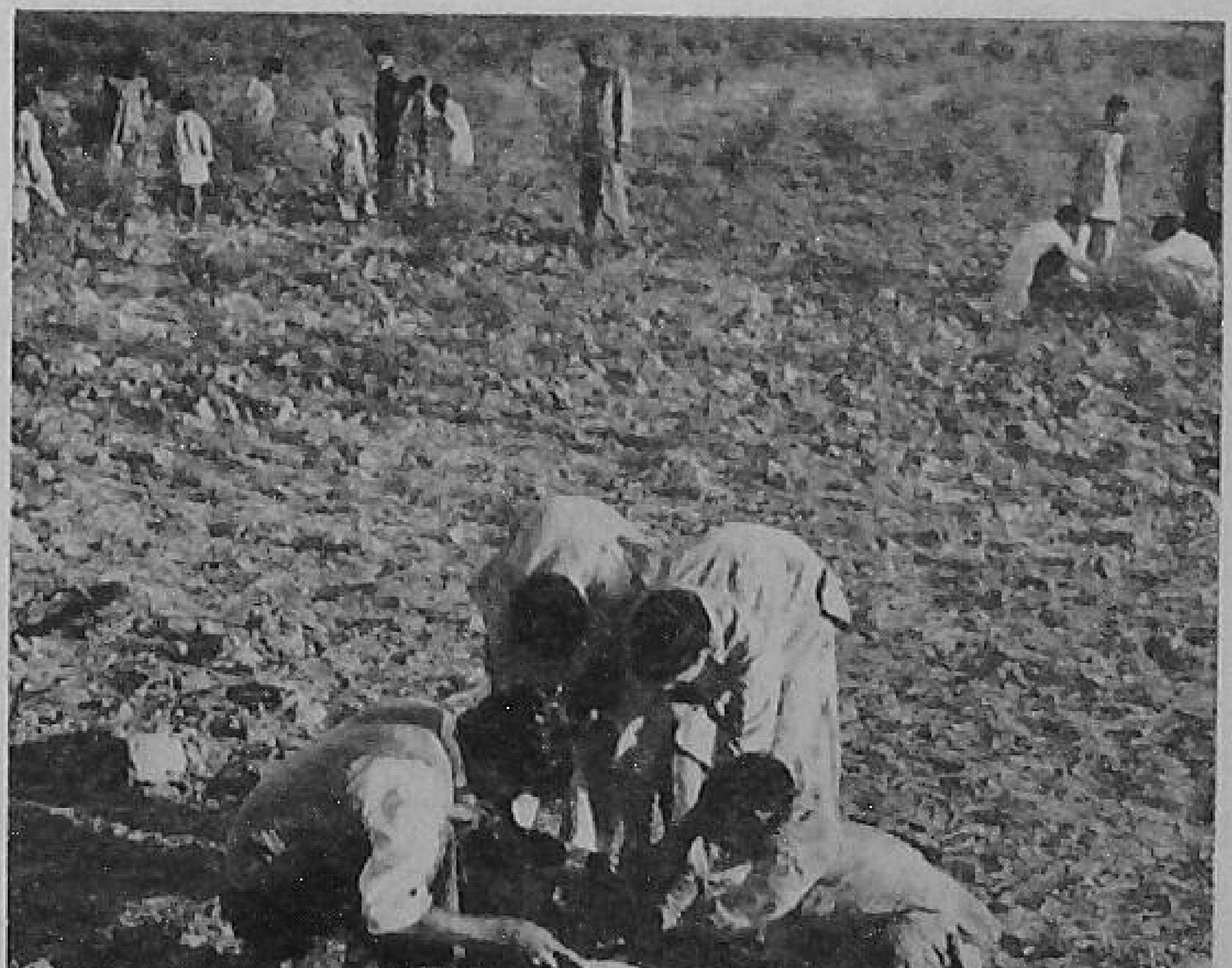
RADIO-ISOTOPES FOR AGRICULTURE

A significant advance in the field of agricultural research is the progress made by the Indian Agricultural Research Institute, New Delhi, in its work on the use of radio-isotopes in soil fertilization and crop improvement. Picture shows a research worker at the Institute studying the behaviour of radioactive phosphorus

News in Pictures

VILLAGERS' EFFORT

People of a village in the Kheragarh Community Development Block in Agra district of Uttar Pradesh widening and deepening the 12-furlong channel built by them to drain off the rain water which was endangering land and crop over a vast area. The drain channel was built in a remarkably short period of time and entirely with the initiative and effort of the villagers themselves



RAT-KILLING CAMPAIGN

As part of the anti-rat campaign in the Union Territory of Delhi, over 400 villagers, school children, Extension staff and leaders of "Teams of helpers" have joined hands to survey an area of over 1,200 acres in the villages of Nilothi and Mahipalpur. The workers have located nearly 30,000 burrows, which now form the target of rat-killing operations

Shri A.P. Jain, Union Minister for Food and Agriculture, inaugurating a symposium on the "Origin, Cytogenetics and Breeding of Tropical Fruits" held at the Indian Agricultural Research Institute in New Delhi, last month. The symposium was conducted by the Government of India and the Horticultural Society of India in collaboration with the UNESCO

HORTICULTURAL SOCIETY MEETS

THE need for a more vigorous role by the Horticultural Society of India in the development of Horticulture in the country was stressed by its President, Dr. M.S. Randhawa, when the Society met at its Seventh Annual General Meeting in New Delhi on 1st December, 1958. The Meeting was inaugurated by Shri K.R. Damle, Secretary, Union Ministry of Agriculture. Addressing the meeting, Dr. Randhawa said:

This Annual General Meeting is unique in the sense that it is being attended by horticulturists of international repute from the U.S.A., U.K., Japan and Ceylon. The message and spirit of Horticulture pervade all strata of society, all walks of life and all countries. In fact, Horticulture is a unifying factor with all its implications of beauty, friendship and goodwill.

The Horticultural Society of India came into existence in 1942 when a group of enthusiastic horticulturists resolved to form a society. After a chequered growth during a short period, the Society has been progressively gathering strength. With barely 20 members on the rolls at the time of its inception in 1942 and 58 in 1949, the Society now claims to have over 400 active members including corporate societies of various regions. The Society is truly representative and is of an all-India character. It has been making serious endeavours to foster the development of Horticulture in all its aspects in the country. The attention given to Horticulture in the Second Five Year Plan is no doubt partly due to the persistent recommendations of the Society for allotting to Horticulture a place in the Plan. *The Indian Journal of Horticulture*, the organ of the Society, covers a wide range of subjects and is a premier journal of the horticultural science in the country. In spite of several difficulties, the Society has been able to bring out this Journal without interruption, mostly on account of the financial assistance given by the Indian Council of Agricultural Research.

The International Symposium on the "Origin, Cytogenetics and Breeding of Tropical Fruits" now in session is the fulfilment of a long-cherished desire of the Society. This would not have been possible but for the responsibilities connected with it having been shared by the South Asia Science Co-operation Office of the UNESCO, and but for the encouragement and financial assistance given by the Ministry of Agriculture. This gathering of research workers from different parts of the world will provide an opportunity to our research workers to exchange views on different aspects and problems of fruit breeding.

The Horticultural Society of India has reached a stage wherein it has to take stock of the horticultural situation now obtaining in this country. There has been increased activity in the field of horticultural research and development with the sanction of schemes under the Second Five Year Plan. Apart from initiating regional fruit stations to work upon local problems, adequate opportunities have been provided for comprehensive research programmes, on both fundamental and applied aspects, connected with plant hormones, micro-nutrients, etc. Many incentives to fruit growers such as distribution of loans for the

purchase of plant material, supply of fertilizers on deferred payment basis, institution of crop competitions and the award of "Udyan Pandit," have been given effect to.

The Indian Council of Agricultural Research is also contemplating the establishment of regional stations for vegetable research. It has also not neglected ornamental gardening. It has already a Committee on ornamental gardening to encourage and regulate schemes of investigations on floriculture. Apart from this, the Indian Council of Agricultural Research has recently organized a Horticultural Development Board to consider problems of growers, the fruit preservation industry, nurserymen and marketing.

NEW IDEAS

An attractive quarterly called *Indian Horticulture* has been started by the Indian Council of Agricultural Research and it has achieved considerable popularity. A number of publications in the horticultural field, books, bulletins and monographs have been published by the Indian Council of Agricultural Research. I am mentioning all this, so that the members of the Horticultural Society may be aware of the several ways in which the Government is attempting to further the development of Horticulture in the country. In all these endeavours of the Government, the Horticultural Society of India can play its part by associating itself with the activities and bringing to the Government new ideas. One of the ways by which the Society can cooperate with the Indian Council of Agricultural Research is by sponsoring Book Clubs to which the Indian Council of Agricultural Research can supply its many publications at concessional rates.

I finally appeal to all members of this Society to work hard for making the Society stronger, so that the Society can work with greater vigour in the service of Horticulture.

In his inaugural address, Shri K.R. Damle emphasized the need for an increased production of fruits and vegetables in the country to meet the present shortage of these protective foods. He said :

I have been closely observing the progress of your Society and I am happy to note the significant achievements which your Society has made under the inspiring guidance and leadership of Dr. M.S. Randhawa, since I addressed you last in 1954. The willing co-operation from various horticulturists, fruit growers and nurserymen who form the membership of this Society has contributed to the progress of this Central Body of Horticulturists. The Society, during the last two decades of its existence, has made notable achievements in the field of horticultural research. In this connection, mention may be made of the Society's persistent efforts towards the establishment of a Central Horticultural Research Institute. As a result of these efforts, a separate Division of Horticulture was established at the Indian Agricultural Research Institute under the Second Five Year Plan. The Society has also been rendering useful and much-needed service to the horticulturists of this country by regularly publishing *the Indian Journal of Horticulture.* This morning, you witnessed the inauguration of the International Symposium on the "Origin, Cytogenetics, and Breeding of Tropical Fruits," the first of its kind held in India. This is also a singular achievement of the Horticultural Society of India, which organized this Symposium with the active co-operation of the UNESCO and the Ministry of Agriculture. I anticipate that this symposium will be a forerunner to the launching of research projects in fruit breeding leading ultimately to increased production of fruit and an organized development of the fruit industry, not only in India but also in the whole of South-East Asia.

It is also hoped that the Society will undertake an even more intensive programme in furtherance of the cause of Horticulture in this country. The development of the horticultural industry generally means greater prosperity to the farmer and better health for the nation. Some horticultural crops are also a source of increased food production. The Government of India is fully conscious of the role that Horticulture can play in the prosperity and well-being of the country and has launched many schemes of development in the country in the Second Five Year Plan. The aim is that the production of fruits and vegetables should be doubled to overcome the present inadequacy of these protective foods. With assured supplies of irrigation water, more and more area is going under fruits and vegetables every year. This along with the rejuvenation of the existing orchards, should go a long way in the increased production of these protective foods.

TEMPERATE FRUITS

There is an increasing demand for temperate fruits, especially the apple. The Government of India has already launched a scheme for the development of temperate fruit cultivation in the hills of the Punjab, Himachal Pradesh, Uttar Pradesh and the Kashmir Valley. Special efforts are also being made to develop the dry region of Chini (Himachal Pradesh) for the production of raisin grapes, almond, walnut and pistachionut. Of late, the seed production of European-type vegetables has assumed a national importance because of the stoppage of imports of seeds from abroad. Breeding programmes in these vegetables have to be intensified to meet our national requirements. In this regard, I am happy to note that the Central Vegetable Breeding Substation, Katrain, is doing useful work. All this denotes the extent of work that lies ahead before we can reach the level of

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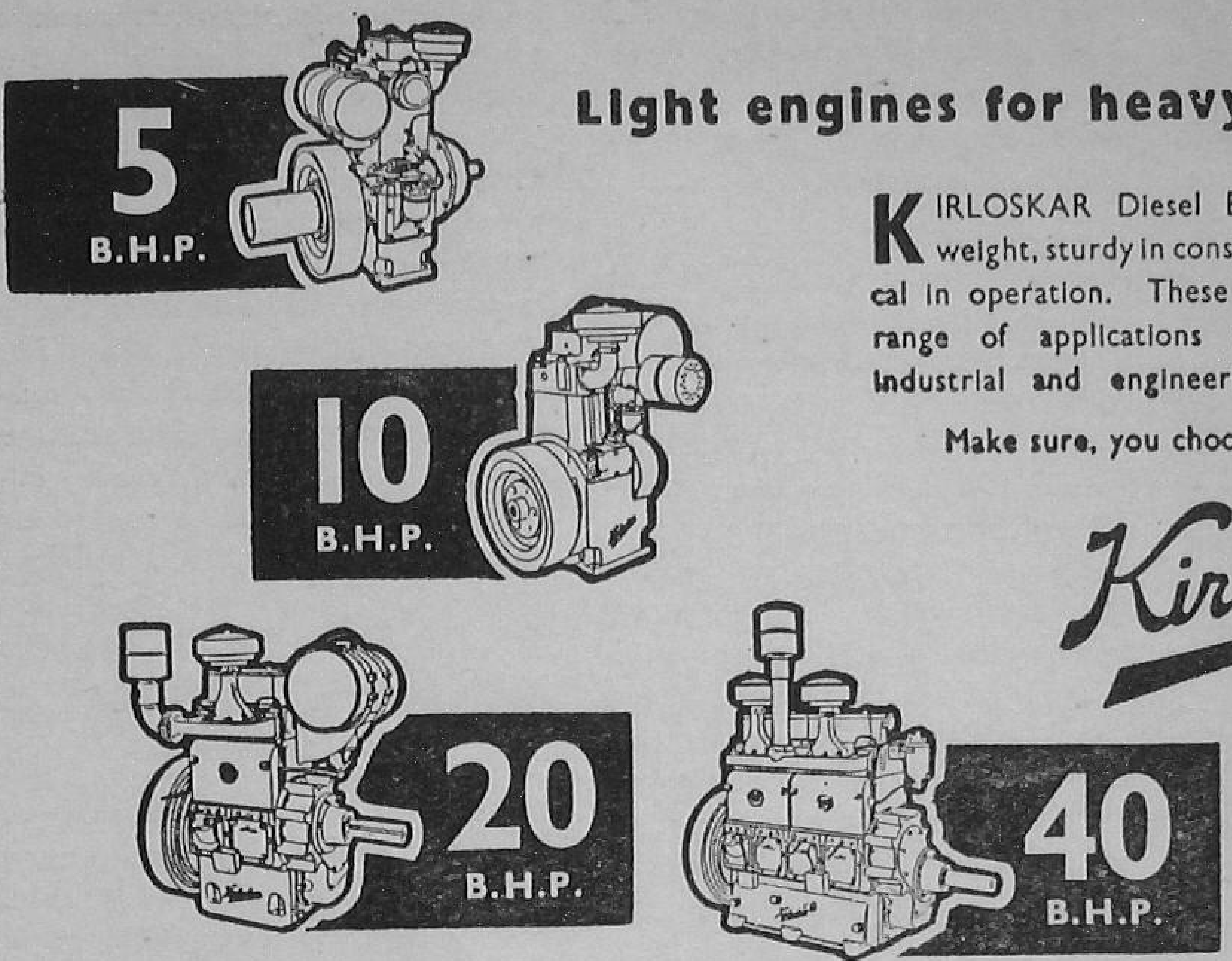

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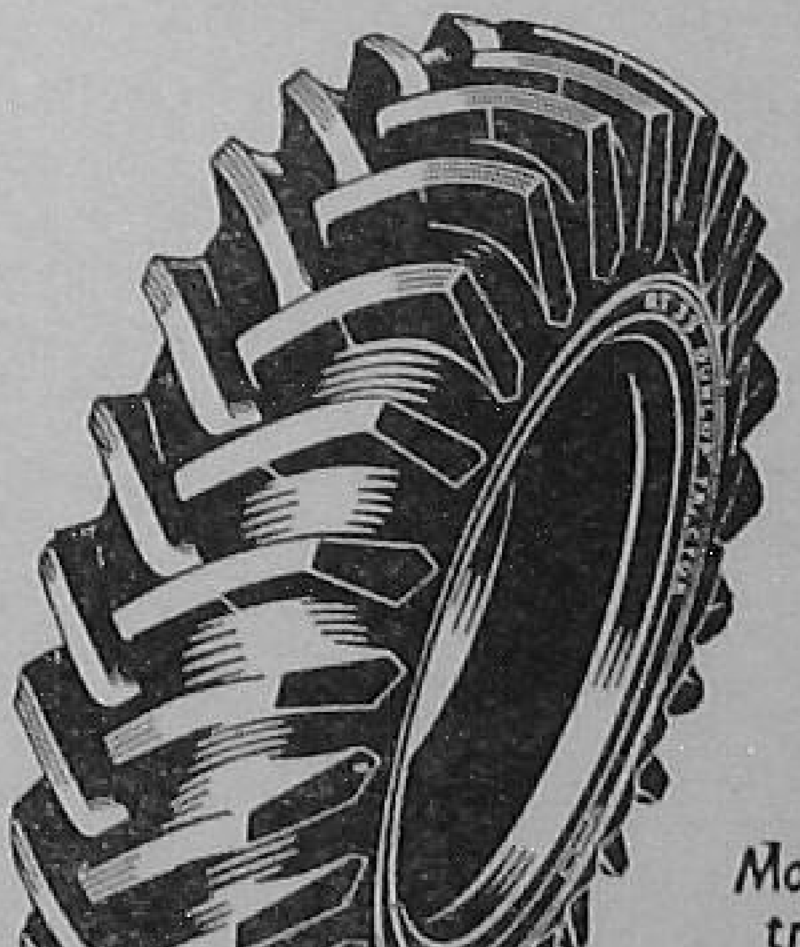
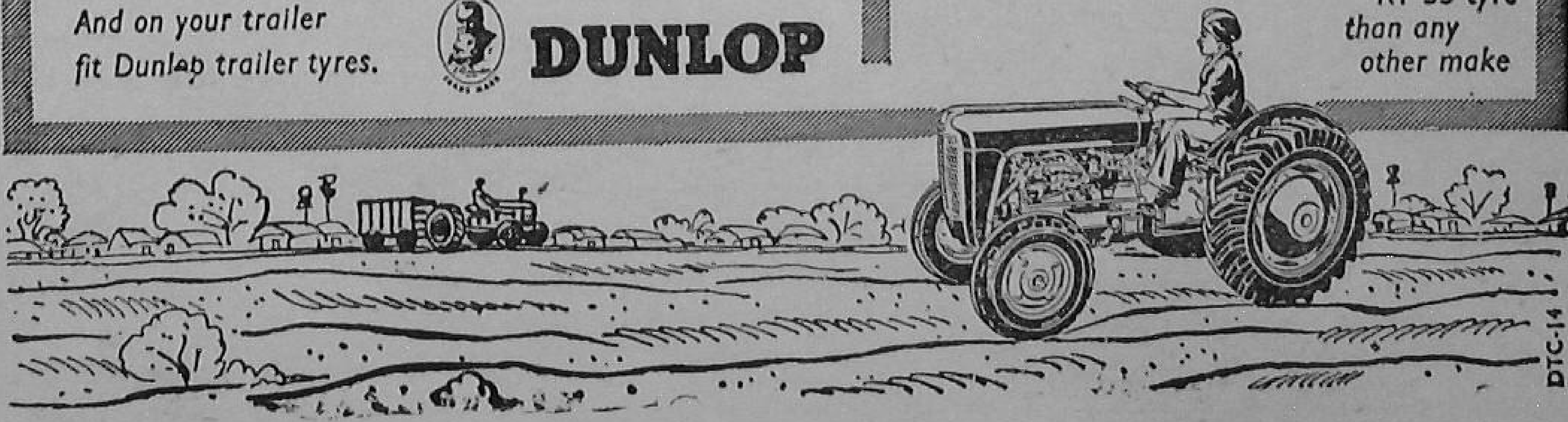
DUNLOP



More tractors in India are fitted with the Dunlop RT 33 tyre than any other make



DTC-14

WHAT'S NEW IN FARMING

COTTON DISEASES

For checking the diseases of the cotton crop there are some simple precautions.

For example, not to stock cotton stalks after harvest when there was an attack from one or more diseases on the cotton crop; pulling out the stems immediately after harvest and burning them along with all shed leaves, flowers and bolls.

Research has found new varieties that resist attack from Wilt, a common disease of cotton in many areas. But for other diseases like Blackarm and Root Rot, no disease-resistant varieties are yet available, and hence the farmers have to adopt other measures in checking their spread.

Intercultivating a legume like *moth*, which covers the soil and prevents the soil temperature from rising, is one good way of checking the Root Rot disease. Patches in which the disease has appeared should also be isolated, and in these cotton should be rotated with some other crop.

For Blackarm and Anthracnose, treating the seed with a chemical before sowing has given good results.

In all cases where a disease has appeared, it pays farmers to show the disease-affected plants to the Agricultural Officer of the area so that he may identify the disease and suggest how it can be controlled.

COMPOSTING PADDY HUSK

A good yellowish and powdery manure rich in plant foods can be prepared from paddy husk.

The manure contains, the experts point out, one per cent nitrogen, 1.6 per cent phosphoric acid, one per cent potash and 2.9 per cent calcium, and will be a welcome addition to our half-starved soils.

The method of converting paddy husk into manure is simple, and can be followed by any farmer.

The husk is spread in the cattle-shed as a ten-inch layer. Over this, about nine inches of paddy straw or any other litter is spread.

The top layer is renewed from time to time. But not so the husk layer. It remains there for about six weeks, after which it is removed and put into a pit and composted.

After about nine months, the paddy husk forms an excellent compost, ready for use.

ARECA SEED NUTS

A Good arecanut farmer should take sufficient care in selecting the palms from which he collects his seed nuts. He should go only to well-known gardens having a larger percentage of high-yielding trees which are more or less of a uniform age. Palms between 25 and 40 years of age should be preferred.

The mother palms should be selected at the time of harvest by observing their vigour and yield, rejecting diseased and the less vigorous trees; also trees having less than ten open leaves, those with less than four bunches and trees which are poor set. The selected trees should be marked out. In the succeeding years, the marked trees should be observed. After a few years, only those trees which are regularly bearing, high-yielding and are vigorous should be left over. It is from these palms that the seed nuts should finally be collected.

In collecting the nuts, only fully tree-ripe nuts from the second or third bunches should be selected, rejecting all undersized, underweight or malformed nuts. The bunches ready for harvest should be lowered carefully with a rope.

A.I. in Poultry

CONTINUED FROM PAGE 16
Barred Plymouth Rock and White Wyandotts, 0.75 ml. of semen could be collected; this quantity of semen is sufficient for inseminating eight to ten birds without diluents. It is better to remove the feed from cocks about six hours before handling them to reduce contamination of semen with faeces.

Insemination of layers should be done in the afternoons, by which time the majority of them will have laid. A hard-shelled egg in the oviduct prevents the movement of the sperms into the infundibulum portion.

The bird to be inseminated is held by one man who pushes back on the tail with the right hand and supports or pushes slightly on the abdomen. With the left hand, pressure is applied on the abdominal muscles in such a way that the oviduct is everted outside the vent. The oviduct opening is on the left side of the cloaca, and a little pressure by the thumb or finger of the second man at the left corner of the vent will sometimes aid in exposing the opening of the oviduct and permit the insertion of the inseminating glass tube.

The semen is then drawn in the glass tube and inserted into the oviduct, the pressure on the abdomen released and the required dose of semen pushed into the oviduct. Releasing of pressure on the abdomen prevents the flow-back of semen. Thereafter, the bird is released.

The dose of semen recommended for chickens varies from 0.75 to 0.1 ml. once a week, and in turkeys every two weeks. Two persons can collect semen from cocks and inseminate about 200 layers in two hours between 3 and 5 in the afternoon. Dilution of semen with physiological saline just before insemination, will facilitate handling of minute quantities of semen.

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Pullorum Infection

CONTINUED FROM PAGE 9 will show off by clumping down the killed germs which are coloured violet for easy reading. Thus, reactors are spotted out and then disposed of. In such hens, the truth of the test can be proved by recovering the germs from the diseased ova.

1. To prevent the dreaded disease buy chicks or eggs only from known disease-free flocks, or Government Farms ;
2. blood-test all breeders with the Pullorum antigen ;
3. do not import eggs, baby chicks, or laying birds except through the knowledge of our Ministry of Agriculture and that of the Ministry of Agriculture of the exporting country, as only then you would be assured of freedom from this as well as other diseases of poultry not so far found in our country ;
4. wash eggs in a warm solution of five per cent "Dettol" or "Cetavelon" before setting them in the incubator, as this prevents the shell contamination due to some paratyphoid germs related to the Pullorum species (which are also chick-killers) from passing into baby chicks ;

CONTINUED ON PAGE 40

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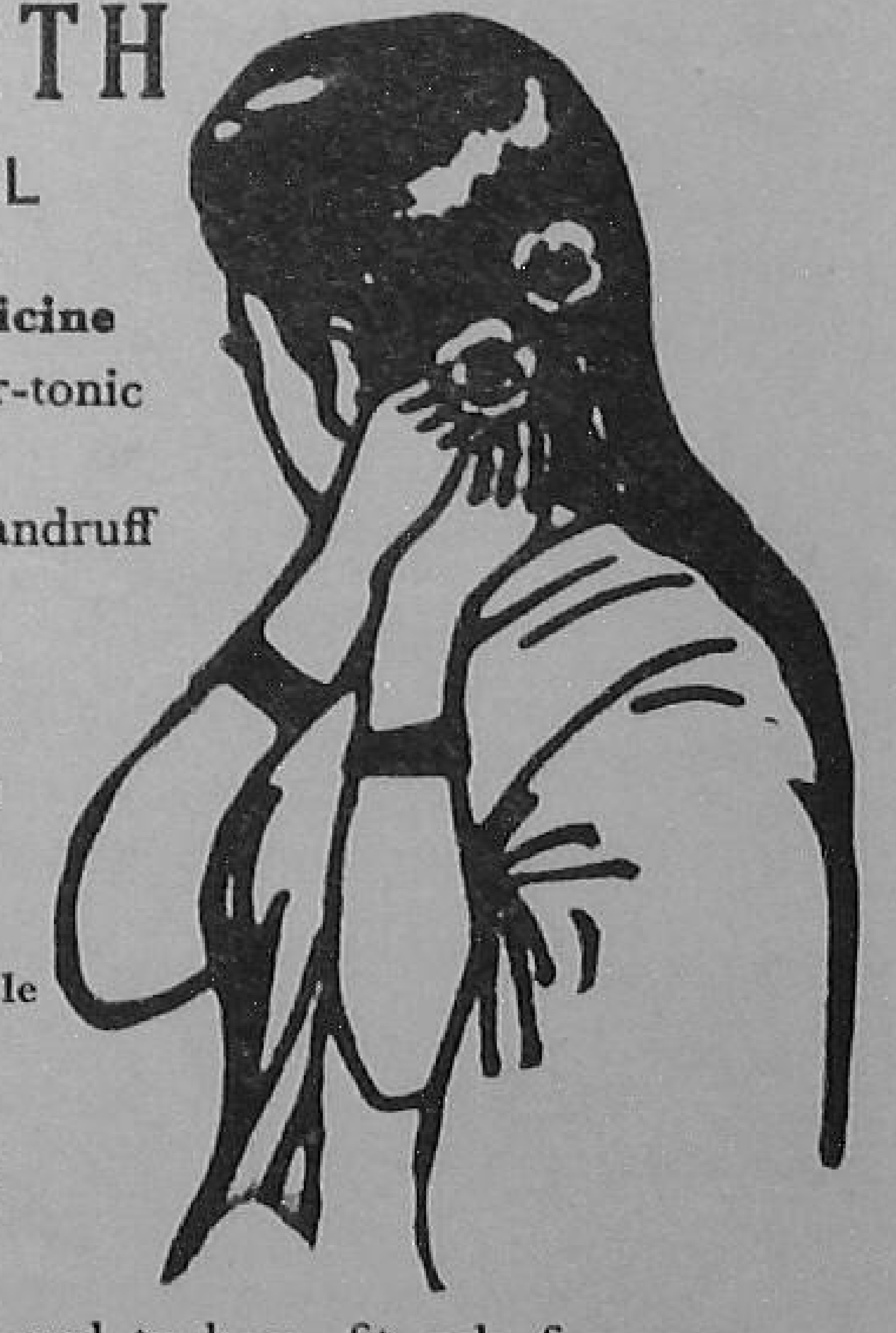

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DON'T WASTE SUGARCANE TRASH

compost it

by
P.P. Chandra
Secretary, Indian Central Sugarcane Committee, New Delhi
and
Chatur Behari

SUGARCANE trash will make valuable manure for your fields if instead of sending it to the waste heap you direct it to the compost heap.

Research at the various sugarcane research stations of the country recommends the following method of composting cane trash, cane leaves, etc. Cattle dung and urine and bulky organic refuse are the other materials used. However, on account of its waxy surface, cane trash takes a little longer time to decompose completely.

A high-lying portion of land near some water channel is selected for the compost heaps. The ground is levelled and, if necessary, rammed with hard *murum.*

The compost heap should be six to eight feet wide, 3½ to four feet high, and of a convenient length according to the material available for composting. If the width or the height is more, the interior of the heap will not get adequate aeration, which may hinder decomposition; if it is too small, the top and the sides will dry up quickly, leaving a large portion of the material undecomposed.

The material for composting is not heaped up straightaway in one lot, but arranged properly in layers. The material is spread about a foot thick and compacted by trampling. A slurry prepared out of dung, ash and earth is then spread over the layer till the whole mass is thoroughly wetted. In this way, four to five layers are put one over the other till the heap is about 3½ to four feet high. The ash, earth and dung absorb moisture and adhere to the surface of the trash, leading to its proper decomposition.

The first turning is done after about five weeks. The turning is started from one end of the heap. The dry material from the top and the sides is removed and spread on the ground, about five feet away from the first heap, and sprinkled over with enough water. Then the second layer from the top is removed and spread on the first layer. This process is continued till the bottom layer comes up on the top of the new heap. The top is then covered or plastered with mud.

Generally, two or three turnings are required for a complete decomposition of the cane trash. The whole process requires 4½ to five months, after which the compost is ready for application in the fields.

There is also another method of preparing compost, the "pit method." A pit six feet wide, three feet deep and 30 feet long (or any convenient length) is dug in a high-lying area where there is a less chance of percolation of water or overflow from the adjoining water channels. The material is arranged in layers as under the "heap method." The pit is filled in layer by layer, till the height of the material is 5½ to six feet from the bottom of the pit, i.e., 2½ to three feet above the ground level.

After a couple of months, the portion above the ground gradually sinks down to the ground level. It is then watered, if necessary, and the top refilled with earth to plug the pit. One or two moderate waterings are necessary during summer. The compost is ready within four to six months and six to eight tons of compost can be secured from each pit. The advantage of the pit method is that no turning of the material is required.

If possible, the temperature and the humidity of the heap should be carefully watched. The temperature in the heap begins to rise after about a week and goes up as high as 50°C ; it should remain at this level for about three weeks. A fall in temperature is an indication for turning the heap. A humidity of 50 to 55 per cent is optimum.

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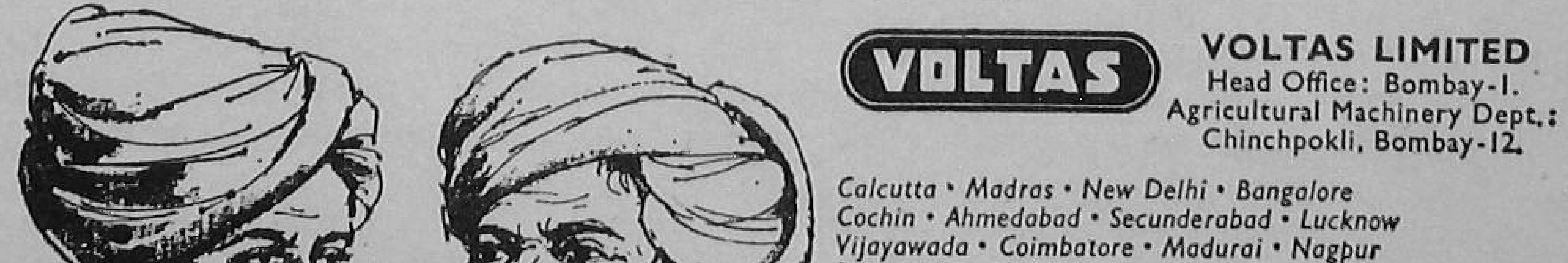

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VOL.58.188

EVEREST

Did You Get Your Soil Tested?

by

R.V. Tamhane

Division of Chemistry
Indian Agricultural Research Institute
New Delhi

YOU may have no control over the weather conditions, but you can certainly regulate the plant food in your soil to get the best out of crops: a soil test before you sow a crop would tell you what fertilizer and how much of it to apply.

Soil samples from farmers' fields are analysed free of cost at the 19 soil-testing laboratories set up by the Government of India with the help of the T.C.M., and advice on the use of fertilizers given. A total of 24 such laboratories is contemplated—at least one in each state; the remaining five are soon expected to go into action. In course of time, the laboratories are expected to cover large areas and provide information on the fertilizer requirements of individual fields.

So far, nearly 30,000 soil samples have been analysed. More than 70 per cent of the samples have revealed a very low phosphorus content in them. In certain areas in Kerala State, these have been found deficient in potash.

Plants require a continuous supply of certain essential elements for their growth. Some are required in large and others in minute quantities. A good balance between these elements in the soil always pays. Any deficiency in these will naturally result in low yields.

The elements that affect plant growth are nitrogen, phosphorus, potassium, calcium and magnesium. These are found in the soil in different quantities which may be sufficient for a few years, but thereafter require to be replenished by manuring and fertilization. The table below gives an idea of the average uptake of nutrients from the soil by a few important crops.

Crop	*Part of the crop*	*Average yield in pounds per acre*	*Approximate removal of nutrients in pounds per acre* N	P	K
Wheat	Grain	800	12	8	4
	Straw	1,600	9	2	20
		Total	21	10	24
Barley	Grain	900	4	8	5
	Straw	1,800	6	3	41
		Total	10	11	46
Paddy	Grain	1,000	13	5	3
	Straw	2,000	16	4	41
		Total	29	9	44
Maize	Grain	700	14	7	5
	Stover	1,400	9	3	12
		Total	23	11	17
Jowar	Grain	600	9	6	4
	Stover	2,400	19	4	42
		Total	28	10	46
Bajra	Grain	500	8	4	6
	Stover	2,000	13	3	48
		Total	21	7	54

Now, if we assume that our soils have been under a continuous one-crop system for the last thousand years and the crop was wheat, then the plant nutrients removed from the soil during the period by the plant, at a level of an average yield of 800 pounds per acre, would

be 21,000 pounds nitrogen, 10,000 pounds phosphorus and 24,000 pounds potassium per acre. In addition, there is considerable loss from erosion. All these losses have to be made good by good management, manuring and fertilization.

STORE OF NUTRIENTS

Soils differ in their capacity to hold nutrients. Essential nutrients such as calcium, potassium, magnesium and ammonia are held by clay and organic matter almost as iron filings are held by a magnet. This greatly reduces their rate of movement through the soil and consequent loss through leaching.

The amount of nutrients that a soil can hold depends largely on the type of soil and the clay minerals present in it. For example, a sandy soil has a lower capacity to hold these nutrients than a clayey soil containing a high percentage of organic matter.

Moreover, the plant food material in the soil has to be supplied to the plant in an available form. For instance, over 90 per cent of the soil nitrogen exists in the form of organic compounds of such a nature that this element cannot be utilized by green plants. But, certain soil bacteria can break up these compounds and liberate nitrogen in mineral forms, i.e., nitrate and ammonia compounds, which are readily utilized by plants.

The activity of these bacteria in turn depends upon the soil condition: in an acid soil it is practically nil, in a saline soil it is poor and again in an alkaline soil it is nil. They are very sensitive to changes in soil conditions ; too much water or water-logging also affects their activity.

Soil organic matter contains about five per cent nitrogen. Each per cent of the organic fraction then represents 20,000 pounds of organic matter or a 1,000 pounds of nitrogen in the surface soil. The rate at which its breakdown or decomposition takes place is determined by the average climatic factors and the soil texture.

Nitrogen thus liberated under ideal conditions in India does not exceed three per cent. Thus, in a soil containing one per cent organic matter and taking the maximum availability of nitrogen to be 3·0 per cent, only 30 pounds of nitrogen are liberated for plant growth. But, this nitrogen can be lost in various ways and ultimately the plant may get only about ten pounds. The range of available nitrogen depends upon the soil texture and the climatic conditions and can be determined from the percentage of organic matter.

Soil phosphorus is another equally important plant nutrient, but much less is known about its chemistry and behaviour in the soil. Plants may frequently exhibit a phosphorus deficiency even on soils containing several thousand pounds of total phosphate per acre furrow. This anomalous behaviour of phosphorus is due to many reactions in the soil.

The native phosphorus in the soils is found in the form of both mineral and organic compounds, but the availability of soil phosphorus depends largely on the reaction of the soil. In an acid soil, the retention of phosphorus is very great owing to the presence of iron and aluminium in appreciable quantities which "fix" the added phosphate and reduce its availability. In most alkaline soils, the activity of calcium is high ; this coupled with a high *p*H favours the formation of more insoluble phosphate.

Phosphorus that is present in an organic compound form in the soils is essentially of three different types and varies between five and 60 per cent of the total phosphorus. This form of phosphate assumes considerable importance in tropical countries. The organic phosphate may also be decomposed or mineralized by the activity of bacteria.

It has been shown recently at the Indian Agricultural Research Institute that not more than nine per cent of the phosphorus applied to the soil in the form of fertilizer is made available to an early variety of paddy ; for a late variety of paddy, only ten to 20 per cent is available. The remainder is "fixed" in a very slowly available form. In some types of soil, this availability is only two to three per cent and is controlled by the type of clay minerals present in the soil.

SOIL TESTS

The first thing a soil test can tell us is whether a soil is acid or alkaline. This characteristic of a soil is called "soil reaction" and is referred to as soil *p*H. Soils with a *p*H of 5·5 or lower are strongly acid while those with a *p*H of 8·0 or higher are distinctly alkaline.

Changes in the acidity of the soil may change the availability of plant nutrients in different ways. Phosphate availability in many soils is the highest when the soil is slightly acid to neutral, and declines when the soil becomes strongly alkaline or acid. A *p*H of 8·5 or over indicates an excess of total salts or presence of sodium which limits plant growth and suggests a need for reclamation of soil before application of fertilizers.

Soil tests reveal to us the relative levels of plant nutrients in the soil and indicate the amount of each nutrient needed for economic returns. The amount of plant nutrients needed is related to the crop grown and to the level of available nutrients in the soil. However, it will be some time before perfect correlations are established between soil test values and response from fertilizer application on all importar crops in an area and for all the essential plant nutrie

Keeping Clear of Colds

IS it really necessary to catch that cold now and again every winter? If you are about to say yes, you are wrong. For a few simple precautions, if carefully observed, would keep the nuisance at bay.

And don't ever get into your head that the *common* cold need not be bothered about. Complications that may follow can be quite serious. The commonest are bronchitis and sinusitis. Infection of the middle ear and pneumonia are less common, but more dangerous.

Here are a few good tips for keeping clear of colds.

Start the day well with a good breakfast.

Keep to a diet containing plenty of fresh fruit and vegetables and well-chosen and well-cooked meals. This will keep up your resistance better than any quantity of pills or potions.

No less important is regular exercise in the fresh air, especially when it is sunny. It would keep you fit and less susceptible to colds.

It is always better to feel warm than cold, especially when out of doors. Cold seems to act in the same way as fatigue by lowering the body's resistance. If the body is well-protected by warm clothing, cold air will do no harm to it; if it is scantily clad and shivery, cold air will do no good.

To have too many clothes is also harmful. Smothering children in layer upon layer of thick jerseys and woollen underwear, as some mothers are prone to do, often has the reverse effect. The child gets overheated and sweats, then the sweat cools and he feels thoroughly chilled.

If you can avoid infection, you can sure avoid a cold. Keep away as much as possible from crowded places. Also try to avoid any one you know has got a cold, though this does require the greatest of tact.

You should not feel overtired when you have called it a day. Fatigue lowers the body's resistance to infection and is a sure invitation to a cold. So, try to get plenty of sleep.

Horticultural Society Meets

CONTINUED FROM PAGE 29

production of fruits and vegetables required for the country.

Apart from the production of fruits and vegetables, there is need for greater attention to ornamental gardening than what has been given to it till now. Since achieving independence, the Government of India has been specially promoting the revival of art and cultural activities. Ornamental gardening also represents the artistic and cultural side of life and landscaping our cities, towns and villages should receive greater attention. In fact, it would be a good idea if the Community Projects and National Extension Blocks could take up this aspect of improving the environments in which the people of our villages live. Dr. M.S. Randhawa, your President, has been actively engaged in promoting the cause of ornamental horticulture. His role in landscaping the modern city of Chandigarh is well-known, as also his publications such as the "Flowering Trees in India" and "Beautifying India." I hope that the Society under his leadership will take active interest in the furtherance of ornamental and landscape gardening in the country and formulate proposals for sponsoring a movement for beautifying our cities and towns. This will be a significant contribution of the Horticultural Society of India. I am sure that the Ministry of Agriculture will give due consideration to whatever progressive proposals are put forth by the Horticultural Society of India for the improvement of Horticulture in this and other ways.

I wish the Society a future of an increasingly important role in the development of Horticulture in this country.

Red Spots on Jowar

CONTINUED FROM PAGE 7 fade to tan colour, become papery in consistency and bear an exudate of bacteria in the form of thin crusts.

The causal fungus has been found to be carried over from season to season on *jowar* and *baru* (*Sorghum halepense*) stubble plants, as also on voluntary *jowar* plants during the winter season. The fungus also remains in a viable condition in the *jowar kadbi* (dried fodder) stacked in the open. In addition, the diseased debris left behind and remaining exposed on the surface of the soil after the harvest of the crop is another very important source of infection. Infected seed does not seem to play a very important role in the perpetuation of the disease under conditions obtaining in the Punjab State.

CONTROL MEASURES

Cut the crop as close to the ground as possible. After this, work the field with a furrow-turning plough so as to bury the remnants.

The stumps of the *jowar* crop are often seen to sprout during winter, and continue to do so till the next sowing season of the crop. These stubble plants help the causal fungus to tide over the off-season. Therefore, carefully destroy all stubble plants by burning, or compost them.

Destroy *baru* which is an additional host of the causal fungus of this disease and helps it to tide over the off-season.

Never stock *jowar kadbi* near the fields where the *jowar* crop is to be sown. Stock it inside a compound or under a roof. Whenever the fodder is fed to livestock, the refuse must be composted.

The *bajra* crop is immune to practically all red leaf-spot diseases of *jowar*. A mixture of *jowar* and *bajra* will, therefore, reduce the incidence of the disease, as the *bajra* plants will check the dispersal of spores to a considerable extent, especially when the rows of the two crops alternate with one another. Adopt this practice wherever feasible. Also, during years of severe infection when the *jowar* crop may be seriously damaged, the *bajra* crop grown in mixture with the *jowar* crop, may ensure a reasonably good harvest.

A rotation with a non-susceptible crop, such as maize or *bajra*, considerably reduces the chances of primary infection in the fields. Avoid successive cultivation of *jowar* in the same field.

Jowar varieties *J. No. 29/1* (Sirsa selection) and *Duggi* (Uttar Pradesh) are quite resistant to the disease. They are also very promising as regards grain yield and possess white grains of attractive quality. Their cultivation is recommended, especially in the heavy monsoon areas of Punjab State, like Gurdaspur, Ambala, Hoshiarpur and Karnal districts.

Shell-fishing In A & N Islands

CONTINUED FROM PAGE 11 The recommendations were duly considered by the Administration and incorporated in the fishing rules framed in the year 1939 under the Andaman and Nicobar Islands Fisheries Regulation, 1938. These rules were further amended in the year 1955, because the fishing conditions had completely changed during the years 1939 to 1955.

In the pre-war years, up to 1941, the Japanese shell-fishing companies of Singapore had a complete monopoly of shell-fishing in these waters. They had sea-worthy diesel-engined boats which were capable of going on the high seas, thus making shell collections possible from fairly extensive areas. After the war, it was proposed to organize this industry with our own local resources. For this purpose, the shell beds were divided into the following nine zones.

- Cape Price to Mayabunder
- Cape Price to Austen Straits
- Mayabunder to Long Island
- Long Island to Shoal Bay
- Shoal Bay to Chiriatapu
- Chiriatapu to Port Mouat
- Ritchie's Archipelago
- Nicobar Central Group
- Nicobar Southern Group

FISHERY MANAGEMENT

Shell-fishing licences are granted by the Administration in the month of October for two consecutive years. The period from 1st May to 30th September is treated as the closed season for the fishery, and no one is permitted to lift shells from their beds in this period except the Fisheries Department for scientific purposes. Ordinarily, there is one licencee for each zone, but in exceptional cases, two zones can also be allotted to one person.

Each licencee must possess a power-driven boat not less than 25 feet in length and powered by a 20 H.P. engine. A certificate of sea-worthiness for such a boat is granted by the Engineer and Harbour Master at Port Blair. In addition to the power-driven boat, each licencee is permitted to engage not more than four boats or *sampans* for the collection of shells.

The licence fee for a power boat is Rs. 400, and for each boat or *sampan*, Rupees ten. For the collection of shells, each licencee can employ not more than 20 divers. Proper licences are to be obtained for these divers also and the licence fee as prescribed under the rules is Rs. 20 per head.

A maximum of 25 tons of shells can be collected in a season from each zone. A royalty at the rate of

Rs. 200 per ton is charged by the State Government on these collections. In addition to the above licence fee and the royalty on shells, each licencee has to pay a premium of Rs. 1,000 per season or part thereof.

To check indiscriminate fishing, the State Government has fixed a maximum diameter limit of nine centimetres at the base for *Trochus* shells and 6.36 centimmetres for the operculum for *Turbo*, below which no shells are to be collected. Every collection of shells is inspected by an authorized officer of that zone. For this purpose, the shells are removed from the boats and stacked on the shore. Measurements are taken for determining the percentage of undersized shells in these collections. To protect the fishery, very strict measures have been enforced by the State Government. They are:

(*i*) if the percentage of undersized shells in any collection is found to be more than ten per cent, then the shell-fishing licence is liable to cancellation;

(*ii*) if the number of undersized shells varies between five and ten per cent, the whole catch is liable to be confiscated to Government;

(*iii*) in a catch where the undersized shells do not exceed five per cent, royalty at double the rate (i.e., Rs. 400 per ton) is charged on the undersized shells found in that collection.

FISHING METHODS

After obtaining a shell-fishing licence, each licencee moves to the area allotted to him and locates a suitable camping place for the first fishing season. Then, a quick survey is undertaken to mark the thickly populated shell beds which should be exploited first. When a suitable area has been chosen, a team of five to six divers is left with a *sampan* and fishing implements on a nearby island. About a week's ration is supplied to them.

The motor-boat tows other *sampans* with divers to other fertile beds and leaves them there. Once in a week or at shorter intervals, depending on weather conditions, the motor-boat visits each party in rotation to gather the shells collected by them and to supply ration for another week. When a sufficient quantity of shells has been collected, it is brought for inspection by the authorized officer and then shipped to the mainland for export to foreign countries.

As the shells of *Trochus* and *Turbo* are found on rocky ledges and the great corridors formed by the massive Madreporarian corals up to depths of eight to ten fathoms, it is convenient to make collections during low tides. The divers leave their camps well in time, so as to reach the collection centres when the tide starts receding. They work hard till it is high tide again.

The methods employed are very simple. No diving kit is used by the divers. A pair of cotton knickers and a vest firmly tucked into it, a pair of goggles of plain glass mounted on a wooden frame and tightly tied by rubber bands around the head complete their equipment.

Before putting them on, the goggles are first cleaned with crushed pieces of cuttle-fish "bone" soaked in sea water. The goggles firmly sit over the nose-bridge and fit the orbits, preventing sea water from getting into the eyes, and also enable the diver to see the bottom clearly. Then, a handkerchief or a towel is tied round the head to prevent slipping of the rubber band of the goggles. The divers then jump into the sea, leaving only one man to manage the *sampan*.

The diver swims at the surface of the water, observing the bottom. Whenever a shell is sighted, he goes down and picks it up with a sharp jerk. In this way, he goes on making the collection. He keeps all the shells collected in his vest until he finds them too heavy to swim with; then he gives a signal to the man in the *sampan* with an uplifted arm and the *sampan* draws close to him. He transfers the collected shells to the *sampan*, and again resumes his work.

When the sea is choppy and the divers are not able to see the bottom clearly from the surface, they dive and swim near the bottom. At intervals of a few seconds to a minute, they come up for breath. As the divers keep on moving along the reefs, the boatman manoeuvres the *sampan* in such a way that he is always in the centre of the working team. With the approach of the high tide, they stop diving and return to the camp in the *sampan*.

On reaching the camp, all the shells collected are put in a tub of sea water and kept over a fire for boiling, when the animal dies and is easily extracted from the shell. Then the shells are spread on the ground to dry. At the same time, excessive deposits of algae, etc., from the shells are scraped off with a long, blunt knife resembling a *dah*. Then the shells are packed in gunny bags for shipment.

The industry brought in a revenue of Rs. 44,573.26 and Rs. 45,722.74 in the years 1955-56 and 1956-57, respectively. If the fishery is properly conserved, it will be a permanent source of revenue to the state. As nearly all the shells collected are exported to Germany, Austria, the U.S.A. and Japan, where the prices range from Rs. 5,000 to 6,000 per ton, the industry holds out promise of becoming a good foreign exchange earner.

The Anand Hoe

CONTINUED FROM PAGE 14

members as well as the joints are well-designed. As the design is of a sturdy nature, there is no chance of breaking the implement while at work. All the wearing parts, especially the blades, are prepared from suitable materials to reduce the wear and tear or repairs

and replacements. The blades of the Anand hoe do not need frequent sharpening as in case of blades used in the local hoes. This certainly helps the farmer save money and time and keeps him free from the botheration of getting the blades sharpened off and on during the working season.

The hitching-nail is prepared out of a bolt and nut. It can be housed in any of the four holes drilled at the end of the beam. Due to this facility, the position of the hitching-nail can be altered. Thus, the hoe can be easily hitched to any bullocks.

As pointed out earlier, the blades are slightly curved. In the case of hoes with the usual or straight blades, the operator has to lift the hoe while in operation to scrape off the weeds, etc., that stick to the blade and get collected at the edge. In hoes with curved blades, the cut or uprooted weeds pass off the side on account of the curvature provided. The curved blades thus (*i*) eliminate or reduce frequent lifting of the hoe to clean the blade, (*ii*) provide a sharp edge for cutting the soil throughout the row, which otherwise could not be achieved by straight blades since they get blunt by weeds that get collected at the edge during the hoeing operation and (*iii*) work quite uniformly within the rows.

COST OF MANUFACTURE

Given below is an idea of the materials required and their cost, for constructing a hoe of the Anand type.

Item	*Cost* Rs.
Beam of local *babul* wood 2 inches × 1½ inches × 12 feet, duly prepared	5 .00
Hitching-hook prepared out of ½ inch dia. R.I. bar-threaded at one end for two inches, with necessary nut and pin	1.00
Handle with grip prepared from local wood	1.25
A pair of clamps for the handle prepared out of M.S. bar of one inch × ¼ inch with four bolts	2.00
Base-plate prepared out of M.S. angle of 1½ inches × 1½ inches × 1/8 inch	2.50
A pair of U-bolts for the above with nuts	1.00
Fork prepared out of one inch × ¼ inch M.S. bar with necessary holes, etc.	2.50
A pair of prongs prepared out of two inches × ¼ inch M.S. bars	4.25
Assembly with colour, etc.	1.00
Total	20.50
Blades for the above-mentioned unit prepared out of 2 inches × ¼ inch flats	
9 inches working length	2.25
12 inches working length	2.75
15 inches working length	3.25
18 inches working length	3.75
	12.00
Grand total	32.50

Bird Guano for Crops

CONTINUED FROM PAGE 18 This compost serves as a good manure for such crops and no other manure is usually applied. It is amazing that every year hundreds of cartloads of compost are collected from the tank bed from April to June and the farmers even carry it in baskets on their heads. But they are not allowed to dig deep at the middle of the tank lest they should uproot the trees on which the birds nest.

Thus all the lands of the village directly or indirectly profit by the use of bird guano from this sanctuary, and the soil fertility of the surrounding lands is at least maintained, if not improved.

However, though bird guano—which is a phosphatic manure—is by itself evoking good yield-responses from paddy it is worth-while combining it with some nitrogenous organic manure, green manure or oilcake, for an increased yield. But so far as the compost from the tank bed is concerned, it is self-sufficient in nitrogenous and phosphatic contents.

The Vedanthangal heronry has recently been declared a sanctuary by the Madras and the Indian Wild Life Boards, and the Government of Madras has more recently introduced a law prohibiting the shooting of these birds (13 specified birds of the sanctuary) anywhere within a radius of 20 miles from the sanctuary. The contemplated measures by the Madras Government to promote large numbers of birds for a longer stay in the sanctuary will not only serve aesthetic interests of bird love and wild-life preservation, but also the economic interests of villagers round about. Some such measures involve a larger extent of water in the tank by some more feeder or supply channels from the nearby surplus tanks, additional *Barringtonia* trees for increasing the nesting sites for birds and, above all, a greater privacy and freedom for the birds in that area through less interference at the sanctuary by the stream of visitors, photographers and bird-watchers. It could also be experimented to grow such suitable trees in the midst of all the larger irrigation tanks and lakes of India to try and attract large breeding water-birds.

CONTINUED FROM PAGE 32

5. hatch only such eggs in your incubator as are from flocks known to be free of this disease, and disinfect your incubator by formalin fumigation periodically ;
6. seek advice from your Poultry Disease Investigation Officer in all such matters.

The Pullorum antigen is available from the Biological Division of the Indian Veterinary Research Institute, Izatnagar. The price for 200 doses or a phial of ten c.c. is Rupees five. The blood-testing, however, should be done by a trained veterinarian only.

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- **Sow quickly and well on the right day,**
- **Give the crop attention whilst it grows,**
- **Harvest at the right time,**
- **Do, in time, all those never-ending duties such as agricultural haulage, soil conservation, water distribution and so on—which mean the difference between shortage and enough.**

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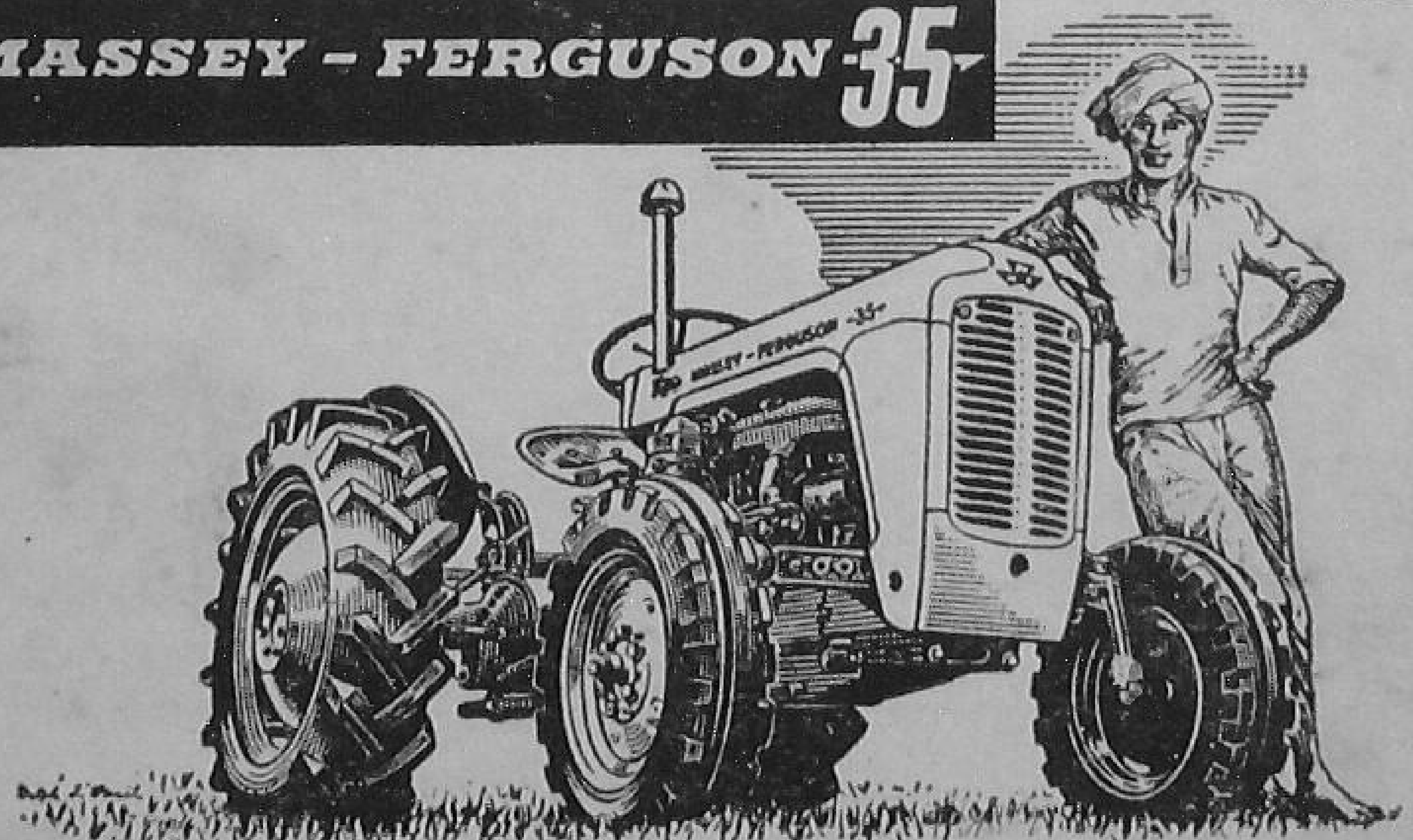

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